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18 DESIGN STUDIES IN INDUSTRIES USING FLUID POWER

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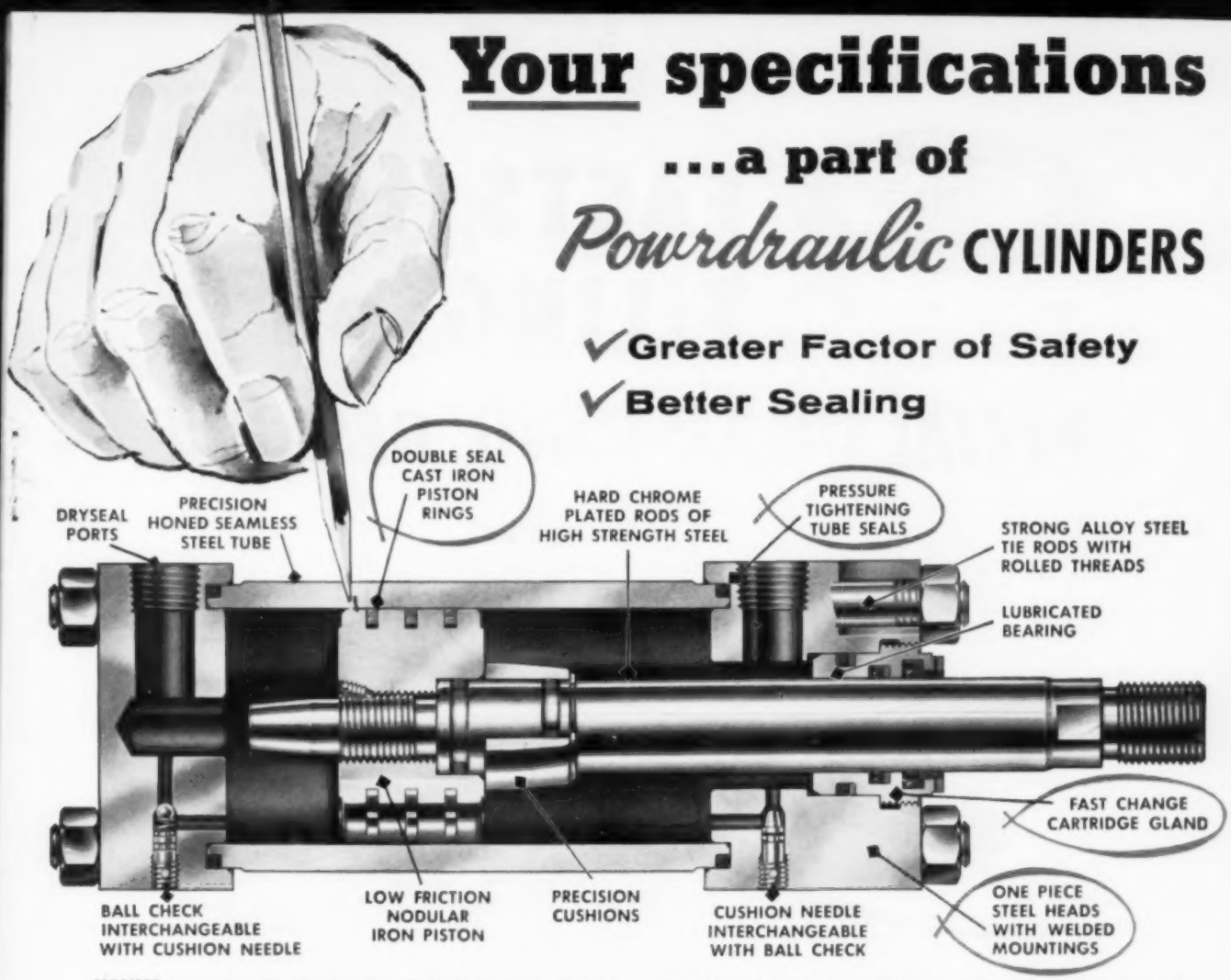
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HARD CHROME PLATED RODS OF HIGH STRENGTH STEEL
PRESSURE TIGHTENING TUBE SEALS
STRONG ALLOY STEEL TIE RODS WITH ROLLED THREADS
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ONE PIECE STEEL HEADS WITH WELDED MOUNTINGS
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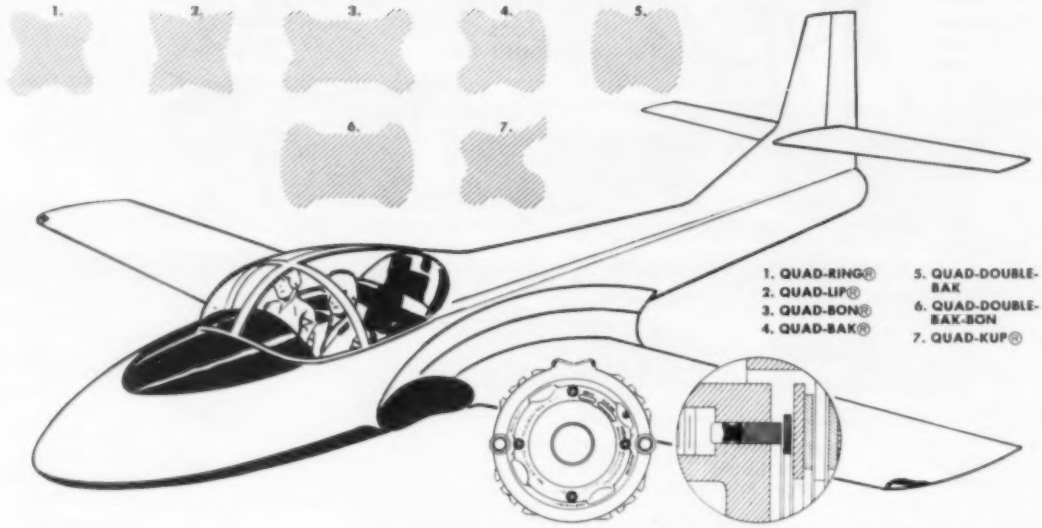

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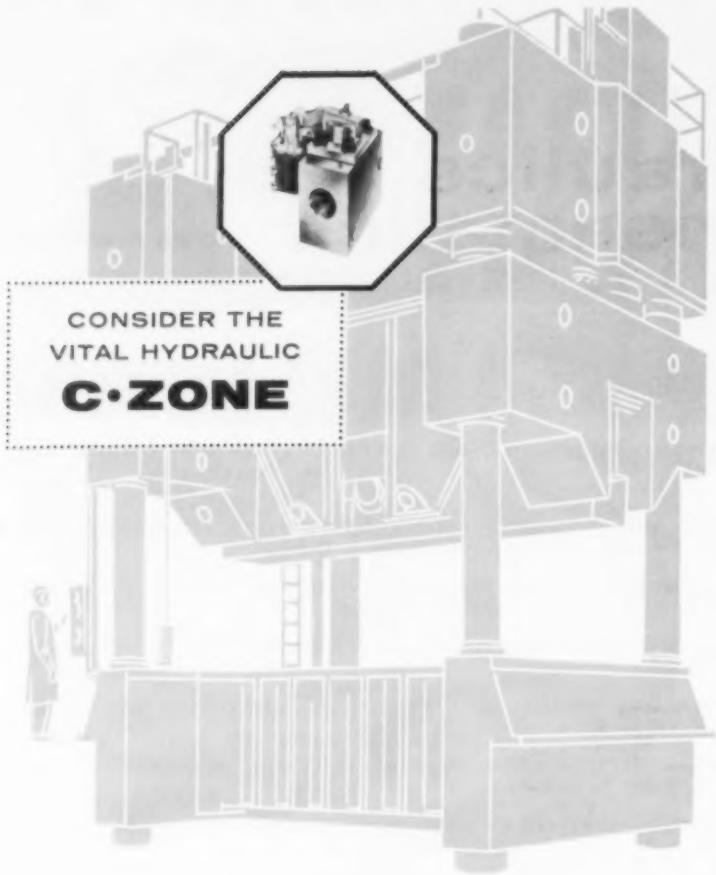

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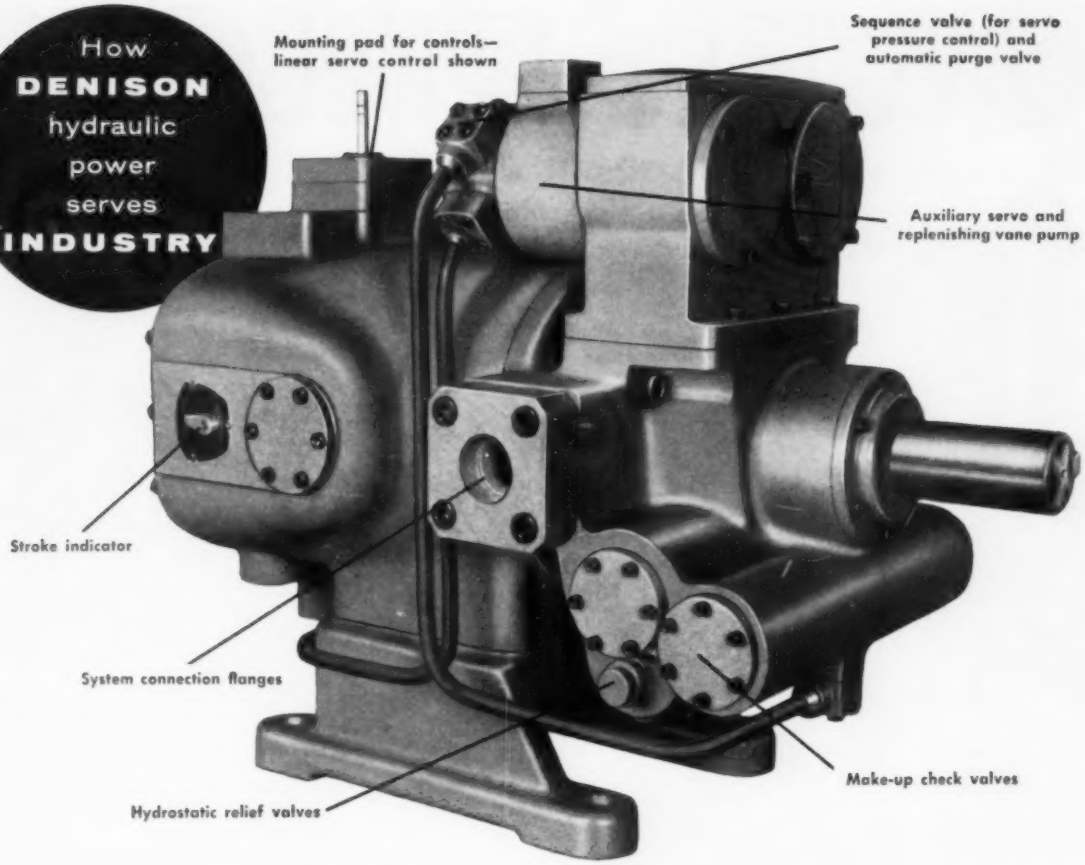
Mounting pad for controls—linear servo control shown
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Stroke indicator
System connection flanges
Make-up check valves
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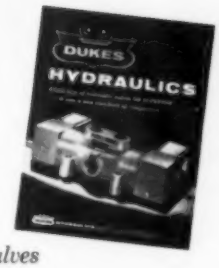

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FLUID POWER LINES

about hydraulics & pneumatics

MOSTEST, CHEAPEST . . . Each of the industries represented in this issue puts special requirements on the fluid power designer. Engineers designing aircraft and missiles are most concerned with reliability, performance, and weight. In contrast, the big considerations in building farm equipment are cost and ease of repair. Here are design objectives that apply to *every* job. How would you list them in order of importance to your work?

- Availability — Standard components usually permit more than one supply source, easier replacement.
- Cost — Always the designer's constant companion. Most industries require designing for profit.
- Ease of Repair—Access to replaceable parts. Does your design need a small man built-in?
- Efficiency — How much of the input power goes into work? How much into heat?
- Interchangeability — Can component parts be replaced or must the user buy a whole new unit?
- Life—What's the machine duty cycle? How long must it last?
- Performance—Where must the machine operate? How accurate must it be?
- Reliability—Protection against power failure, unusual operation.
- Size—Mounting space allowed.
- Weight—Does the system fly?

JUST OUR TYPE . . . Being very close to the printing business, we were especially interested to learn about Mergenthaler's *Hydraquadder* for linotype machines, page 103. It's an oil-powered precision device that replaces mechanical operation and does it better.

BETTER BREW . . . Louis Pasteur may not have known it, but his research has resulted in healthier beer, as well as milk and other foods. We learned that when we visited with Val Mayer who designed Barry-Wehmiller's pasteurizing machine. It's the first system we've seen where sequence valves sequence sequence valves.

DON'T THROW DIRT . . . An overhead crane handling copes and drags in a foundry has to move smoothly or it will throw dirt. How do you automatically regulate a flow control for smooth acceleration and deceleration. There's an answer in the article on page 83.

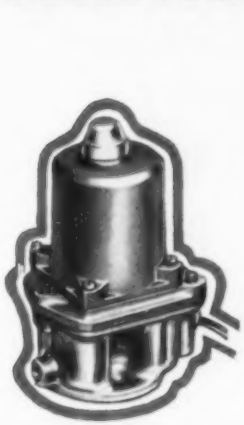
MORE DATA ON HIGH PRESSURE . . . Another successful application of 6000 psi oil is detailed in the article describing the Army's new dozer-grader-scraper. Empty, this machine weighs 16,000 pounds. A high pressure system was important to keep down weight and size.

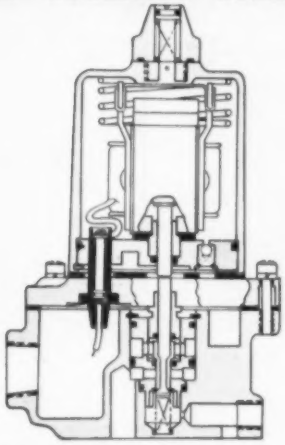
DOUBLING IN BRASS . . . To an actor, that means taking two parts in a show. Yale and Towne got the same performance from a pressure switch in their coil up-ender described on page 106.

INDUSTRIAL SUPERMARKET . . . The annual design show is a wonderful opportunity to get a fast course in new industrial products. You can examine them, find out how they work, learn about their advantages. To help organize your legwork, you'll find previews of fluid power components in *Along the Aisles* on page 56.

a basic Ross *valve building block*

GOLDMODEL VALVE HEAD





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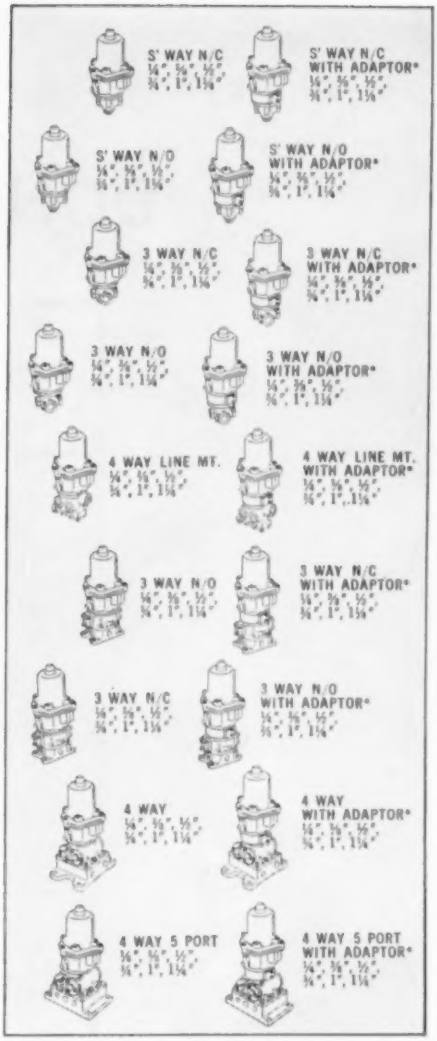
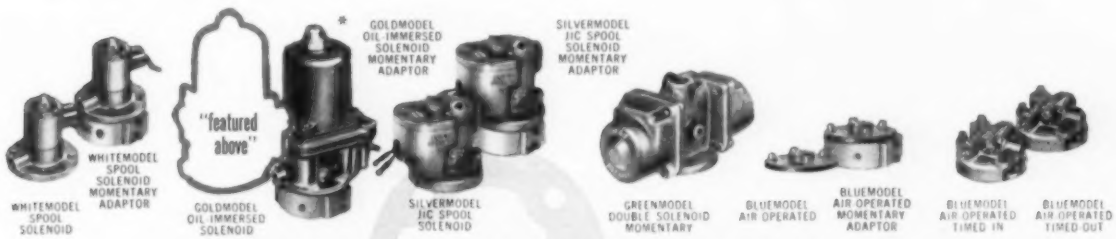
- The finest achievement in solenoid heads
- JIC
- Over 50 million cycles in tests
- Lightning fast

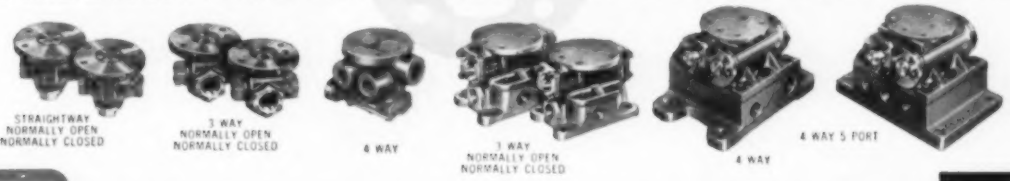
Modular construction is brought to the air valve field to give you the effect of a great valve inventory without stocking a great number of valves. Stock just one of these Goldmodel heads and you have the finest solenoid actuator obtainable for any one of the 54 Skyline bodies. This is the head designed especially for those uses where dependable performance and very long life must supersede all other considerations. The dustproof solenoid is the very finest and is immersed in oil to run cool and stay young. Write for bulletin 318.


5 WAY N/C
5 WAY N/C WITH ADAPTOR*
5 WAY N/O
5 WAY N/O WITH ADAPTOR*
3 WAY N/C
3 WAY N/C WITH ADAPTOR*
3 WAY N/O
3 WAY N/O WITH ADAPTOR*
4 WAY LINE MT.
4 WAY LINE MT. WITH ADAPTOR*
3 WAY N/O
3 WAY N/C WITH ADAPTOR*
3 WAY N/C
3 WAY N/O WITH ADAPTOR*
4 WAY
4 WAY WITH ADAPTOR*
4 WAY 5 PORT
4 WAY 5 PORT WITH ADAPTOR*


WHITEMODEL SPOOL SOLENOID
WHITEMODEL SPOOL SOLENOID MOMENTARY ADAPTOR
"featured above"
GOLDMODEL OIL IMMERSED SOLENOID
GOLDMODEL OIL IMMERSED SOLENOID MOMENTARY ADAPTOR
SILVERMODEL JIC SPOOL SOLENOID
SILVERMODEL JIC SPOOL SOLENOID MOMENTARY ADAPTOR
GREENMODEL DOUBLE SOLENOID MOMENTARY
BLUEMODEL AIR OPERATED
BLUEMODEL AIR OPERATED MOMENTARY ADAPTOR
BLUEMODEL AIR OPERATED TIMED IN
BLUEMODEL AIR OPERATED TIMED OUT

"every head meets every body at this gasket"

ALL SKYLINE HEADS AND BODIES ARE BUILDING BLOCKS TO GIVE YOU MANY VALVES FROM A FEW HEADS AND BODIES


STRAIGHTWAY NORMALLY OPEN NORMALLY CLOSED
3 WAY NORMALLY OPEN NORMALLY CLOSED
4 WAY
3 WAY NORMALLY OPEN NORMALLY CLOSED
4 WAY
4 WAY 5 PORT

STAY AHEAD

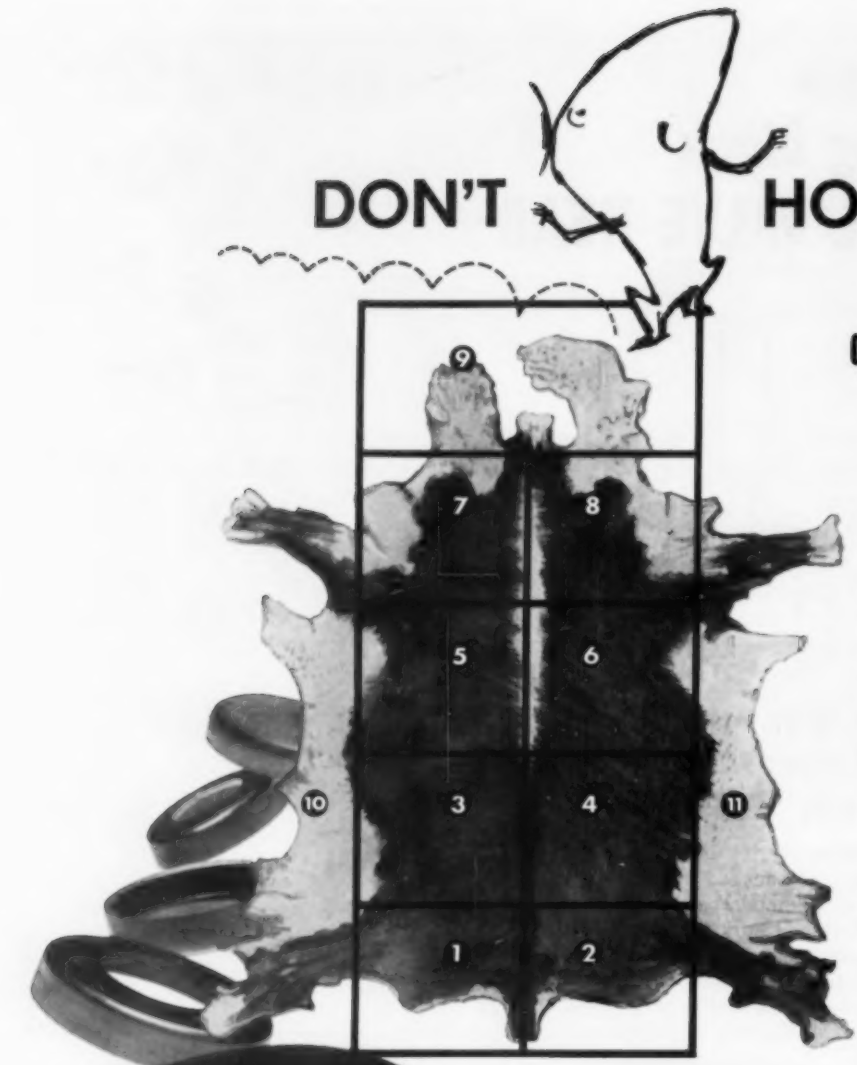
MODERNIZE

Ross OPERATING VALVE COMPANY

105 EAST GOLDEN GATE AVE. • DETROIT 3, MICH.

Circle **145** on Time-Saver Card

DON'T HOPSCOTCH for quality in leather packings!



There are a lot of variables in the proper selection of leather for packings or oil seals. For example, what section of the hide is best for your application? . . . How should it be tanned? . . . Impregnated? . . . Designed? . . . Molded?

The "custom" approach is used by IPC for leather *and* synthetic packings. Let IPC "in" on your problem. Our experience and attention to detail can give you a winner on your first try. It pays to do business with specialists.

OIL SEALS
PACKINGS
PRECISION MOLDING
Custom designed
. . . for your application

IPC

INTERNATIONAL PACKINGS CORPORATION

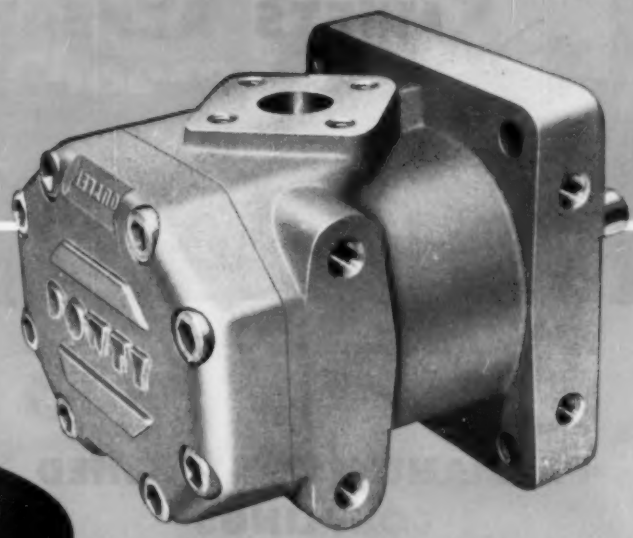
Bristol, New Hampshire

P4

NOW AVAILABLE IN THE U. S. FROM BERRY HYDRAULICS

Pressures to 2500 PSI

Output from 1 to 60 GPM



DOWTY
PRESSURE BALANCED

HYDRAULIC GEAR PUMPS

Developed and proved in England

Volumetric efficiencies exceeding 90% are normal in this line of gear pumps developed in England by Dowty Hydraulic Units Ltd. and now offered for the first time in the United States by Berry Hydraulics. Unique cartridge design eliminates any internal alignment trouble. The entire pumping assembly is self-compensating for normal wear, thermal expansion, pressure fluctuation and fluid viscosities, assuring dependable operation and long life. For economy and improved performance in any application requiring fluid power get the facts on Dowty Pumps.

FEATURES

- Pressure balanced self-compensating design . . . eliminates major cause of internal leakage
- Unique cartridge construction . . . minimum of working parts
- Superior performance over a wide range of operating speeds, pressures, temperatures and oil viscosities
- High output to weight ratio . . . medium pumps weigh under 1 lb. per horsepower
- 14 sizes in 4 model groups . . . clockwise or counter-clockwise rotation . . . flexible coupling or overhung belt drive
- Both flange and foot mounting offered on all models

APPLICATIONS

- Road building machinery
- Farm equipment
- Fork lift trucks
- Power shovels, backhoes, etc.
- Hydraulic power packages
- Presses, machine tools, etc.
- Garbage disposal, dump trucks
- Marine applications

BERRY HYDRAULICS

A division of Oliver Tyrone Corporation

Manufacturers of rotating piston pump/motors from 7½ to 300 GPM, pressures to 3000 PSI.

General sales office: Oliver Building, Pittsburgh 22, Pa.
Southern sales office and plant: Corinth 1, Miss.

MAIL THIS TODAY FOR COMPLETE DATA

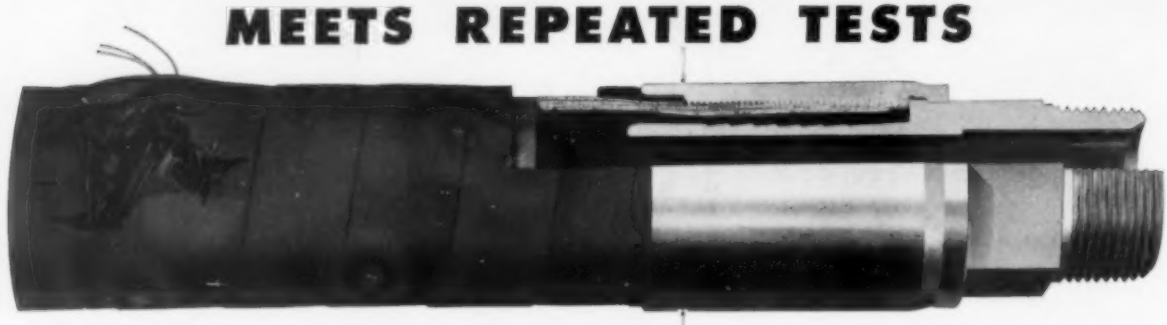
Berry Hydraulics
2241 Oliver Building, Pittsburgh 22, Pa.
Please send information on Dowty Hydraulic Gear Pumps to:

Name_____

Company_____

Address_____

Eastman APPLICATION MEETS REPEATED TESTS



Tests prove that Eastman couplings applied to super high pressure 4-ply spiral wire hose assure successful assemblies. Couplings hold well above minimum burst pressure.

PERMANENTLY ATTACHED COUPLINGS PROVIDE BOND STRONGER THAN HOSE ITSELF!

Increasing demand for greater power brought about the use of higher pressures in hydraulic systems. This not only calls for greater hose strength, but far more critical engineering in coupling design and application.

EASTMAN is contributing toward the development of the trend toward higher pressures—not only in the design and application of coupling to hose—but in the more exhaustive tests required to assure adequate safety under high pressure operations.

The actual photo above is typical of many tests in Eastman laboratories proving that the hose did not fail at the coupling—demonstrating that the coupling was designed and applied to form *a bond which was stronger than the hose itself.*

If you have an application requiring higher pressures, let our engineering department demonstrate the superiority and economy of Eastman applications, and quote on complete Hydraulic Hose Assemblies.

Eastman
first in the field

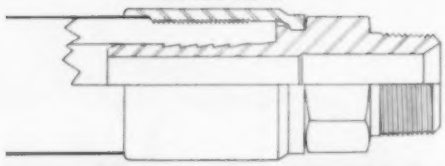
MANUFACTURING COMPANY
Dept. AH-5
MANITOWOC, WISCONSIN

WRITE today for your copies —

Technical Bulletin 100—Medium Pressure Hose and Tube Assemblies, Couplings and Fittings for One Wire Braid Hose.

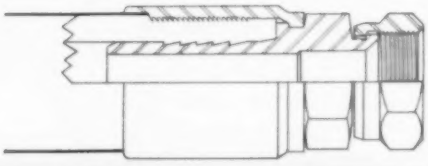
Technical Bulletin 200—High Pressure Hose and Tube Assemblies, Couplings and Fittings for Multiple Wire Braid Hose.

MALE NPTF



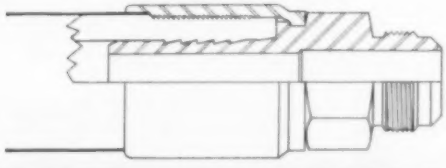
Catalog No.	Hose I.D.	Hose O.D.	Coupling I.D.	Min. Burst Pressure (P.S.I.)	Max. Wkg. Pressure (P.S.I.)
	(inches)				
8412-12M	¾	1 7/16	19/32	20,000	5,000
8416-16M	1	1 ¾	25/32	16,000	4,000
8420-20M	1 ¼	2	1 5/64	12,000	3,000
8424-24M	1 ½	2 ¼	1 21/64	10,000	2,500

SWIVEL FEMALE JIC-37°



Catalog No.	Hose I.D.	Hose O.D.	Coupling I.D.	Min. Burst Pressure (P.S.I.)	Max. Wkg. Pressure (P.S.I.)
	(inches)				
8412-12FH	¾	1 7/16	19/32	20,000	5,000
8416-16FH	1	1 ¾	25/32	16,000	4,000
8420-20FH	1 ¼	2	1 5/64	12,000	3,000
8424-24FH	1 ½	2 ¼	1 21/64	10,000	2,500

MALE JIC-37°



Catalog No.	Hose I.D.	Hose O.D.	Coupling I.D.	Min. Burst Pressure (P.S.I.)	Max. Wkg. Pressure (P.S.I.)
	(inches)				
8412-12MH	¾	1 7/16	19/32	20,000	5,000
8416-16MH	1	1 ¾	25/32	16,000	4,000
8420-20MH	1 ¼	2	1 5/64	12,000	3,000
8424-24MH	1 ½	2 ¼	1 21/64	10,000	2,500

LETTERS
to the editor

Address your letters to: Editor, APPLIED HYDRAULICS & PNEUMATICS MAGAZINE, 812 Huron Rd., Cleveland 15, Ohio.

Signal needed to indicate fluid flow reversal

TO THE EDITOR:

We are interested in a device which will provide an electrical signal to indicate reversal of fluid flow in a hydraulic system. This device should be sensitive enough to provide a useable output (operate a relay) at about 0.5 gpm and be capable of handling 100 gpm with minimum restriction of flow. The electrical output must provide an indication of the direction of the flow. System pressure may be as high as 3000 psi.

GEORGE MCCONNELL
Vickers Incorporated
Machinery Hydraulics Division
Detroit, Mich.

More requests for servo issue

TO THE EDITOR:

One of our customers pointed out the excellent article in your February, 1959 issue on Hydraulic Servo Valves. We certainly would appreciate receiving a copy, and we would like to obtain a subscription to your magazine.

JOHN J. GOODE
John J. Goode Associates
Ashland, Mass.

TO THE EDITOR:

I would like to obtain an additional five copies of the Servo Valve article in your February, 1959, issue. This article has been read by many persons in the department and they have expressed an interest in having a copy.

GEORGE B. WOLF
Research & Development Dept.
Vickers Incorporated
Detroit, Mich.

TO THE EDITOR:

This is to confirm my telephone request for 25 copies of the Servo Valve article. We feel this article was the best and most fair representation of the servo valve "medicine show" to date. It was certainly interesting to go through this condensed data and muse over the

Continued on page 16

Choose Right...
Choose Pathon
4 Way Directional Control Valves

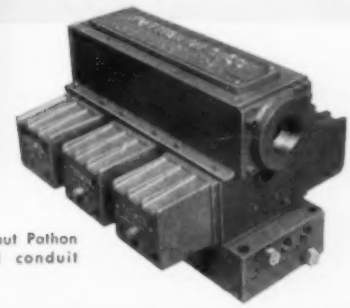
#2H4W1-S
¼" N.P.T. Ports
1¼ GPM
Direct Solenoid
2000 psi service

#2H4W3-S
⅜" N.P.T. Ports
8 GPM
Direct Solenoid
2000 psi service

#2H4W6-PS
¾" N.P.T. Ports
20 GPM
Pilot Operated
2000 psi service

They're
- Dependable
- Immediately Available
- Interchangeable with other good valves

Stock valves are equipped with 115 volt/50-60 cycle solenoids, however 230 volt/50-60 cycle, 460 volt/50-60 cycle, and others, are available on short notice. Both bottom plumbed and side plumbed subplate are available. Write for full information.



Inquire about Pathon valve and conduit manifolds.

Pathon MANUFACTURING COMPANY
C-59 3823 PACIFIC AVE. • CINCINNATI 12, OHIO
FLUID OPERATED AND CONTROL EQUIPMENT

Circle 127 on Time-Saver Card

PRECISION "O" RINGS

Quality proved by all ASTM Tests

Precision "O" Rings made from Compound 830-70 meet or exceed all the SAE 120-R requirements for heat, oil resistance and other properties.

100% better compression set. Remarkable superiority in 300° F hot oil. 100% better Fatigue Test life.

For manufacturers of automobile, machine tool, farm equipment and similar equipment, Precision Compound 830-70 is your answer to positive long sealing life.

Have a sealing problem? You'll find the answer at Precision! There's a Precision engineer ready to help you.

Get your free copy of our engineering data sheet on Compound 830-70.

Specify Precision—first in Quality

Precision Rubber Products Corporation

"O" Ring and Dyna-seal Specialists

Dept. 1, Oakridge Drive, Dayton 7, Ohio **Canadian plant at: Ste. Thèrése de Blainville, Québec**

. . . Fluid Power news

REPORT No. 11,703 NEW SPEED FOR SHIP'S FREIGHT ELEVATORS

From Oilgear Application-Engineering* Files

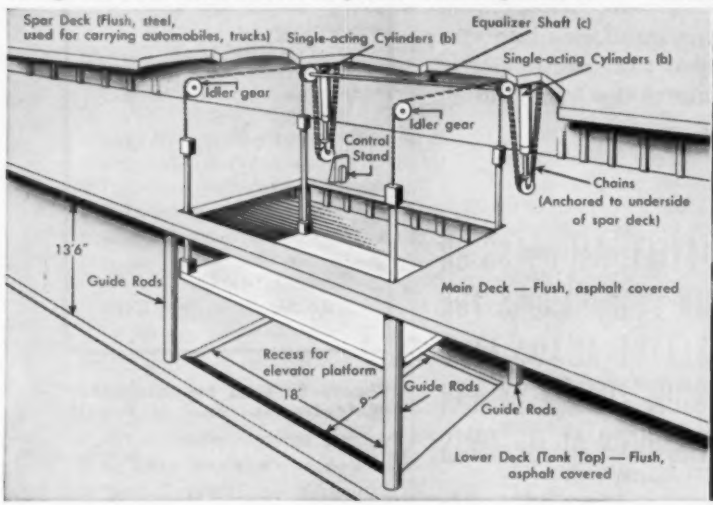
HOW OILGEAR Æ* SOLVED PROBLEMS OF HIGH-SPEED, SHIPBOARD FREIGHT ELEVATORS

OWNER: Canada Steamship Lines Limited

(Builder — Collingwood Shipyards, Division of Canadian Shipbuilding & Engineering Limited)

DATA: Oilgear was employed on a consulting basis to decide which of two experimental hydraulic systems should replace slow, untidy, steam, shipboard freight elevators. (Both systems were found to have serious power, control, or installation problems.)

REQUIREMENTS: 1: Power and control for four elevators in each of two new 460-ft. ships — the S.S. Fort Henry, and S.S. Fort York . . . the first new Great Lakes package freighters to be built in over 25 years. Both ships will be required to maintain fast, tight schedules with palletized freight or bulk grain. 2: A 16-second max. time for the 13½-ft lift-lower cycle with a 10-ton load. 3: Be completely "fail-safe" in event of power failure. 4: Platforms must have four-way, drive-on, drive-off lift truck accessibility — eliminating counterweight systems. 5: Systems must be leak-tight and have provisions for complete "sealing-off" when grain is carried. 6: Must be thrifty with electrical power, as all four elevators operate simultaneously — a heavy load on the ship's power generating system.



SOLUTION: A new Oilgear power and control system for each of four elevators per ship that surpasses all original requirements . . . has many "Patent Pending" features. For each elevator there is an Oilgear "Power-Pak" using a size DH-60, variable displacement, two-way pump with hydraulic servo control, an electric motor, mounted on a semi-hermetically sealed reservoir. "Down cycle" power regeneration is an outstanding feature that provides exceptional electric power economy. In regeneration, the downward load on cylinder fluid drives the Oilgear pump as a motor — driving the electric motor, reducing electrical power input. This system could regenerate ALL of the energy stored in the elevator platform and payload, if the ship's electrical system could absorb the feedback from the electric motors. As the generating system cannot stand a high degree of electrical feedback, an Oilgear regeneration limitation control valve is installed to closely limit the amount of regeneration practical to use during the "down" cycle of the elevators. Other features are: 1: Speed of operation — lift-lower cycle averages 14 seconds . . . an increase of 10 complete work cycles per hour more than originally specified . . . 100 tons per hour increase in possible payload at normal elevator capacity. 2: A continuous, automatic, self-leveling system that keeps platform at deck level regardless of load changes. 3: Automatic "fail-safe" system that holds the platform in position if power fails. 4: Single lever speed and direction control. 5: A leak-tight, trouble-free, dependable system in a "grain-tight" housing. Oilgear's business is the engineering and building of the finest, complete systems supplying the power for — and the control of any linear or rotary motion. Oilgear *Application-Engineered Controlled Motion Systems* are simplest to install, operate, and maintain — they're a complete system for a specific application — with one responsibility for that entire system.

Breakaway drawing shows Oilgear Controlled Motion elevator system operating between main and lower decks. Fluid Power from Oilgear "Power-Pak" is piped to two single-acting cylinders (b) mounted vertically from the underside of the spar deck. Controlled Fluid Power forces rams down, bringing elevators up through a simple chain-pulley system. Equalizer shaft (c) keeps elevator platform level at all times. Photo above illustrates the complete ease of unloading platform with two lift trucks operating from opposite sides. During normal loading or unloading operations, 14 or more lift trucks and truck-trains are used to keep pace with the 4 elevators. Photo — right — taken from elevator platform 'tween decks shows operator at the control stand. Continuous, automatic, self-leveling interlock can be seen at arrow (d). Chain-pulley system and equalizer shaft (c) are also clearly visible to side and top.

Other Oilgear marine applications include power and control systems for steering and flanking gear, catapults, hoists, winches, large valve controls, lock and dam gates.

. . . for the lowest cost per year — it's Oilgear!

For similar practical solutions to YOUR rotary or linear drive and control problems, call the factory-trained Oilgear Application-Engineer in your vicinity. Or write, stating your specific requirements, directly to . . .

THE OILGEAR COMPANY

Application-Engineered Controlled Motion Systems

1564 WEST PIERCE STREET • MILWAUKEE 4, WISCONSIN

all STEEL

New Fulflo all-steel, piston type, oil relief hydraulic by-pass valves combine proven features with the advantages of all-steel construction in flange models from 1" to 2".

FULFLO

ALL-STEEL, ALL-BRASS OR OTHER COMBINATIONS FOR POSITIVE AUTOMATIC PRESSURE CONTROL YOU CAN DEPEND UPON AT ALL TIMES

all BRASS

Fulflo Valves feature shear-closing action for quiet, non-chattering operation. They offer greatest safety, matched to job conditions. Priced right for O.E.M. use . . . built right for superior replacement service.

- Standard and flanged models • Just 6 springs for pressures to 500# • Steel, cast iron or brass bodies • Brass, steel or stainless pistons • Pipe sizes to 3"
- Specials to your requirements

FREE, completely NEW CATALOG . . . just off the press!

THE FULFLO SPECIALTIES CO., INC.
415 Fancy Ave.—Blanchester, Ohio

Circle **64** *on Time-Saver Card*

LETTERS

system use of the various valves shown. A few of them are competitive, but most have found their place in the present state of the art.

D. I. Critoph
Lear, Inc.
Elyria, Ohio

BEACH OR MOUNTAINS?

It won't settle that perennial vacation problem, but a cash award in the APPLIED HYDRAULICS & PNEUMATICS prize paper contest will finance two weeks of fun for you and your family.

An entry can tell how you designed that hydraulic or pneumatic machine, or report the results of a development project you have worked on.

Check number 240 on the time saver card for a rules booklet.

Wants to find manufacturer of tracer valves

TO THE EDITOR:

Would you please send us information on Tracer Valves and tell us whether or not they are manufactured as a commercial item. They are not listed in the 1959 Designers Guide Issue. We read your magazine with keen interest—keep up the good work.

Earl Reding
Bendix Aviation Corp.
Kansas City, Mo.

The valves are actually hydraulic servo valves with a mechanical control. We are sending you a list of companies that manufacture them.

Requests annual index

TO THE EDITOR:

We are establishing a library of magazines containing valuable information. We are setting up a yearly index for the various publications.

Do you publish such an index, and would it be possible to obtain

Continued on page 18

NEW PRODUCTS

NEW ANCHOR WELD TYPE FITTINGS FOR PIPE OR TUBING

The progress in hydraulic equipment design and the increasing complexity of this equipment has started a trend toward the use of pipe or tubing assemblies for the transmission of hydraulic fluid, with flexible hose assemblies used to connect the pipe or tubing to valves, pumps, etc. The use of pipe threads and pipe fittings in connecting these assemblies has created difficult piping problems.

To meet the specific need for a more satisfactory and convenient method for connecting pipe or tubing assemblies to hydraulic equipment, Anchor is introducing a new line of 3000 psi Weld Type Fittings, designed to be used with Anchor patented SAE 4-Bolt, Split-Flange Clamp Halves and "O" Ring, Flanged Head Couplings. With their use, pipe or tube assemblies can be made from a single length of pipe or tubing, bent to conform to any desired shape. Made with a socket type fitting for welding onto the end of pipe or tube, and a saddle type for welding onto the pipe anywhere along its length, an assembly of any shape or desired number of openings can be produced. Also available are 90° Elbow Fittings and Tee Fittings with SAE 4-Bolt connections for joining 2 or 3 hose assemblies.

Anchor will furnish fittings for their customers' pipe assemblies, or will manufacture the assembly to the customer's specifications.

A supplement to Anchor Catalog No. 402, with complete specifications of the new Weld Type Fittings, is available on request from Anchor Coupling Co. Inc., 387 No. Fourth St., Libertyville, Ill.

EXTRA!

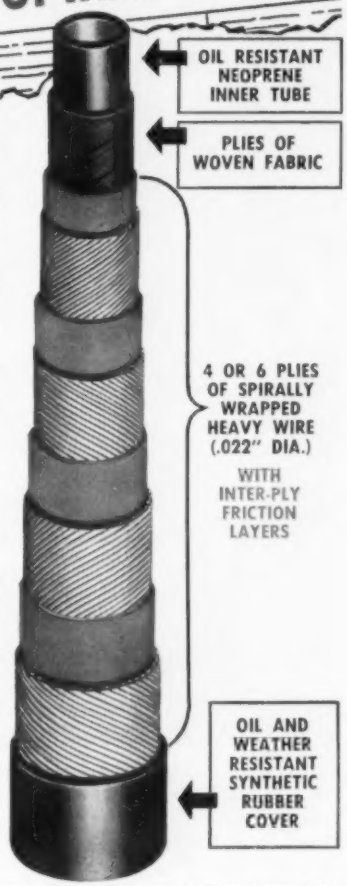
HIGHER HYDRAULIC PRESSURES NOW FEASIBLE WITH NEW ANCHOR "SUPER-SPIRAL" HOSE

Designers of hydraulic equipment wishing to increase pressures have been hampered by the lack of dependable, extra high pressure hose. With the introduction of Anchor's "SUPER-SPIRAL" Hose, these limitations have been removed. This hose is already finding wide usage in the replacement of old style braid hose to obtain greatly extended service life.

This hose, available in sizes from 3/16" to 1½" has either 4 or 6 plies of all spirally wound heavy wire reinforcement, with no crossed wires to fatigue, break and weaken hose.

It offers a completely new maximum pressure range for the hydraulic engineer,—opens up new horizons for the hydraulic designer.

- **4 or 6 Plies of Spirally Wound Wire Reinforcement**
- **Maximum Working Pressures from 12,500 psi (3/16" I.D.—6-Ply) to 2500 psi (1½" I.D.—4-Ply)**
- **Heavy Wire, .022" Dia., Reinforcement**
- **All Spirally Wound—No Braid, No Crossed Wires That Lead to Wire Fatigue**
- **Available with Any Anchor Pressed-On Couplings**


OIL RESISTANT NEOPRENE INNER TUBE
PLIES OF WOVEN FABRIC
4 OR 6 PLIES OF SPIRALLY WRAPPED HEAVY WIRE (.022" DIA.)
WITH INTER-PLY FRICTION LAYERS
OIL AND WEATHER RESISTANT SYNTHETIC RUBBER COVER

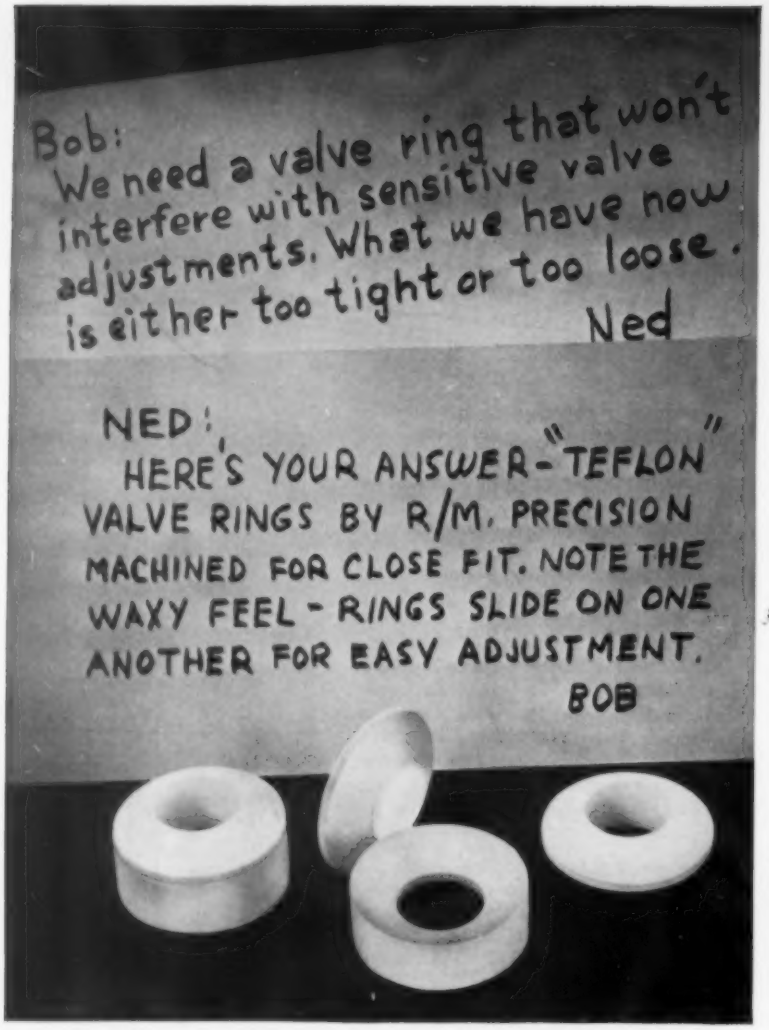
Andy Anchor says: You will find all descriptive details and specifications on Anchor's new "SUPER-SPIRAL" High Pressure Hose and the Couplings in a special data sheet now available on request.

I.D.	FOUR PLY		SIX PLY	
	MAX. WORK. PRES. (psi)	MIN. BURST. PRES. (psi)	MAX. WORK. PRES. (psi)	MIN. BURST. PRES. (psi)
3/16"	10,000	40,000	12,500	50,000
1/4"	8,750	35,000	11,250	45,000
3/8"	7,500	30,000	10,000	40,000
1/2"	6,250	25,000	7,500	30,000
3/4"	5,000	20,000	6,250	25,000
1"	4,000	16,000	5,000	20,000
1-1/4"	3,000	12,000	3,500	14,000
1-1/2"	2,500	10,000	3,000	12,000
*2"	2,000	8,000	2,500	10,000

*Under Development

ANCHOR COUPLING CO. INC.

386 No. Fourth St., Libertyville, Ill.
Branch Plants: Dallas, Texas; Plymouth, Michigan


Bob:
We need a valve ring that won't interfere with sensitive valve adjustments. What we have now is either too tight or too loose.
Ned
NED:
HERE'S YOUR ANSWER - "TEFLON" VALVE RINGS BY R/M. PRECISION MACHINED FOR CLOSE FIT. NOTE THE WAXY FEEL - RINGS SLIDE ON ONE ANOTHER FOR EASY ADJUSTMENT.
BOB

"Teflon"* Valve Stem Packings are just what you need when you are making sensitive adjustments on slow moving rotary and reciprocating equipment. The precision machined rings slip on each other and exert pressure against the valve stem or rod. Because it does not react to any known chemical and has no known solvent, "Teflon" is ideal where corrosion is a problem. It has excellent nonadhesive properties—an added benefit if you are handling viscous fluids. "Teflon" Valve Stem Packings are supplied in wedge and angular type and as solid unit rings.

R/M also manufactures a complete range of homogeneous and reinforced valve stem packings engineered to meet many other requirements: high temperatures, high pressures, high speeds, temperature extremes, etc.

Feel free to call on the experienced R/M packing engineers for details and service, whatever your packing needs.

R/M MAKES A COMPLETE LINE OF MECHANICAL PACKINGS—including Vee-Flex®, Vee-Square®, Universal Plastic, and "versi-pak"®; GASKET MATERIALS; and "TEFLON" PRODUCTS. SEE YOUR R/M DISTRIBUTOR.

*A Du Pont trademark

R/M PACKINGS
RAYBESTOS-MANHATTAN, INC.
PACKING DIVISION, PASSAIC, N.J.
MECHANICAL PACKINGS AND GASKET MATERIALS

RAYBESTOS-MANHATTAN, INC., Mechanical Packings • Asbestos Textiles • Industrial Rubber • Engineered Plastics Sintered Metal Products • Abrasive and Diamond Wheels • Rubber Covered Equipment • Brake Linings Brake Blocks • Clutch Facings • Industrial Adhesives • Laundry Pads and Covers • Bowling Balls

Circle **137** on Time-Saver Card

LETTERS

a copy for our quick reference file?

J. M. PERCIVAL
Chief Manufacturing Engineer
The Singer Manufacturing Co.
Bridgeport, Conn.

Each year, the December issue carries a complete index. Reprints of the 1958 Editorial Index are available without charge to readers of AH & P.

Needed: a flaring tool

TO THE EDITOR:

We have a job requiring a double flaring tool for $\frac{3}{16}$-in. by .035-in., temper 5052-0, aluminum tubing. Please advise where we may find hand or power tools to do this work.

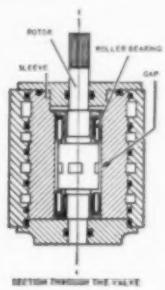
JEFF C. CAMPBELL
Texas Apparatus Co.
Houston, Texas

Perhaps one of our readers can help you locate a flaring tool for this job.

December article error is corrected

TO THE EDITOR:

On page 100 of the December issue of APPLIED HYDRAULICS & PNEUMATICS there is an article entitled "Fluid Power at Farnborough." Reference is made to a new

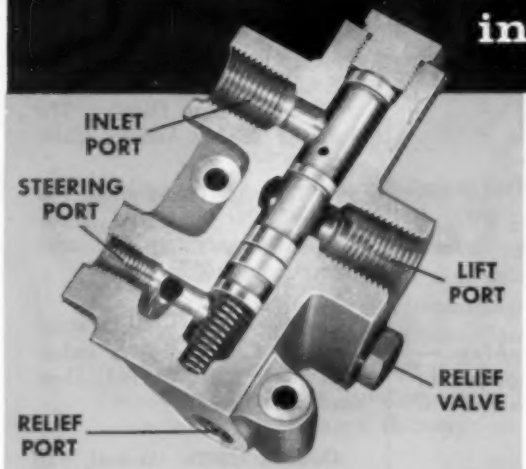


rotary valve purported to have been introduced by H. M. Hobson Limited. This is incorrect, the valve having been developed by Boulton Paul Aircraft Ltd. A copy is enclosed of the leaflet from which the section diagram of the valve was taken.

F. F. CROCOMBE
Boulton Paul Aircraft Ltd.
Wolverhampton, England

DYNAMIC DIFFERENCE

in hydraulic performance



BULLETIN HY1A contains performance and installation data on the complete line of Webster positive displacement gear type pumps, fluid motors and valves. Write for your copy.

Call the man from Webster

. . . he's one of a staff of engineers, specially trained in hydraulic application. He can help you solve special problems when hydraulics become a part of your design!

photo courtesy of THE FRANK G. HOUGH CO., Libertyville, Illinois

Webster

HIGH CAPACITY FLOW DIVIDERS

Material moving magic! 20 cubic feet at a bite, this highly maneuverable front-end loader cuts big piles down to size — without missing a beat. Hydraulics play an important roll here — in power steering, in powering the bucket. But there's only *one* hydraulic pump. A Webster flow divider supplies *both* hydraulic circuits — and permits each to be operated *simultaneously* at different pressures from a *single pump!*

There are more advantages . . . Webster flow dividers operate at pressures up to 2000 psi, capacities to 60 gpm. They're small, compact to fit easily in tight quarters on mobile equipment. Adapt easily and economically to your product and the job.

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our 55 *th year*

This Yates-American "first" now

STANDARD IN THE INDUSTRY

FIXED BUNDLE DESIGN: Flanged baffles — pioneered by Y-A — give extra-wide, leak-proof contact between tubes, baffles and shell for more effective liquid seal, less tube wear.

Y-A Heat Exchangers

combine high efficiency cooling with valuable space-conserving design

ROLLED TUBE JOINTS: Industry-accepted standard of quality construction.

WIDE CHOICE OF MATERIALS: Copper, steel, brass, bronze, stainless steel, Admiralty, and special materials on request.

FIXED AND REMOVABLE BUNDLE: Single and multiple pass designs. Fixed bundle from 2" to 10" dia. Removable bundle 5" to 31" dia. Other models available on special order.

Wherever there's a heat transfer problem — whether with diesel engines or hydraulic equipment — there's a Yates-American exchanger to solve it.

Radiators

For 30 years, Y-A heat transfer products have proved themselves in the toughest assignments. Whatever your requirements, from die-drawn brass tanks to fabricated steel, Y-A can help you.

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FUTURE EVENTS

May 25-28: Annual Design Engineering Show, Convention Hall, Philadelphia, Pa.

June 14-19: SAE summer meeting, Chalfonte - Haddon Hall, Atlantic City, N. J.

August 10-13: SAE National West Coast meeting, Hotel Georgia, Vancouver, B. C., Canada.

September 14-17: National Farm, Construction, and Industrial Machinery Meeting, Production Forum, and Display. Milwaukee Auditorium, Milwaukee, Wisc.

September 21-25: ISA 14th Annual Instrument-Automation Conference Exhibit, International Amphitheatre, Chicago, Ill.

October 5-10: SAE National Aeronautic Meeting Aircraft Manufacturing Forum, and Aircraft Engineering Display. The Ambassador, Los Angeles, Calif.

October 12-16: Pneumatics & Hydraulics for Industry Exhibition and Convention. Alexandra Palace, London, England.

October 22-23: 15th Annual National Conference on Industrial Hydraulics, Hotel Sherman, Chicago, Ill.

October 26-28: Annual Fall Meeting, National Fluid Power Association, Statler Hotel, Detroit, Mich.

October 28-30: SAE National Fuels and Lubricants meeting, La Salle Hotel, Chicago, Ill.

December 11: Association of Lift Truck & Portable Elevator Manufacturers, Roosevelt Hotel, New York, N. Y.

RIVETT SQUAREMASTER "100" CYLINDERS

Unfailing POWER for MILLIONS of cycles!

Here's sure power for unfailing cylinder operation. SQUAREMASTER 100's are the world's finest constructed cylinders—perform with 100% efficiency! 200 P.S.I. air to 500 P.S.I. oil. Available in 7 mountings with standard dimensions, in 10 bore diameters, internal and external threading. Special models and cover combinations. Priced competitively; prompt delivery; meet all J.I.C. requirements.

RIVETT, INCORPORATED

Dept. AH-5, Brighton 35, Boston, Mass.

*Initial High Coefficient of Static Friction

POWER-PACKED FEATURES PROTECTED BY POWER-GUARD CONSTRUCTION

1. Piston rod. Ground and polished alloy steel. Hard chrome-plated. **2.** Piston rod bearing. Replaceable cartridge-type. **3.** Piston packing adjusts automatically. V-block packing minimizes friction. **4.** Correctly stressed tie rods. **5.** Cushion bushings. Bronze, floating type. **6.** Ports rotated to any 90° position. **7.** Steel covers. Take minimum mounting space.

Send for catalog. Proof of SQUAREMASTER efficiency stated in these 20 pages. Write today.

RIVETT furnishes a complete power package

AIR AND HYDRAULIC — VALVES, CYLINDERS, POWER UNITS

Member — National Fluid Power Association

Why do hydraulic engineers specify Superior (SAE) Hydraulic Tubing for pressures up to 3000 psi?

Superior (SAE) Hydraulic Tubing meets both SAE Standards and AMS 5050E and ASTM A179 Specifications. But its usefulness goes much farther—it is widely selected for application in systems operating under pressures up to 3000 psi. There are many reasons for this preference. It has an ultimate tensile strength of 60,000 psi max., a yield strength of 25/45,000 psi, and an elongation of 35/45% in 2 in. It has a recommended maximum working pressure range of 530 to 11,750 psi, depending on OD and wall thickness. Every length is hydrostatically tested under maximum working pressure before shipment. It is made of nonaging steel, maximum carbon content 0.12%, and will therefore not become brittle in storage or service. It is specially coated with a waxlike rust preventive on both inside and outside surfaces, rather than being merely oil treated.

Superior (SAE) Hydraulic Tubing is better than pipe. It is easily bent—pipe fittings, which are subject to leakage, are eliminated. It does not require threading, which removes metal and weakens the wall. It absorbs vibration by reducing the number of fittings needed and by providing the required strength with minimum wall thickness. It has a bright, smooth, scalefree interior to minimize turbulence and pressure drop.

In addition to SAE Hydraulic Tubing, Superior offers more than 120 analyses of materials for fabrication into small diameter tubing. This wide range permits you to select the one that is just right for your specific application. For complete information, contact your nearest Superior distributor or write to us. Superior Tube Company, 2030 Germantown Ave., Norristown, Pa.

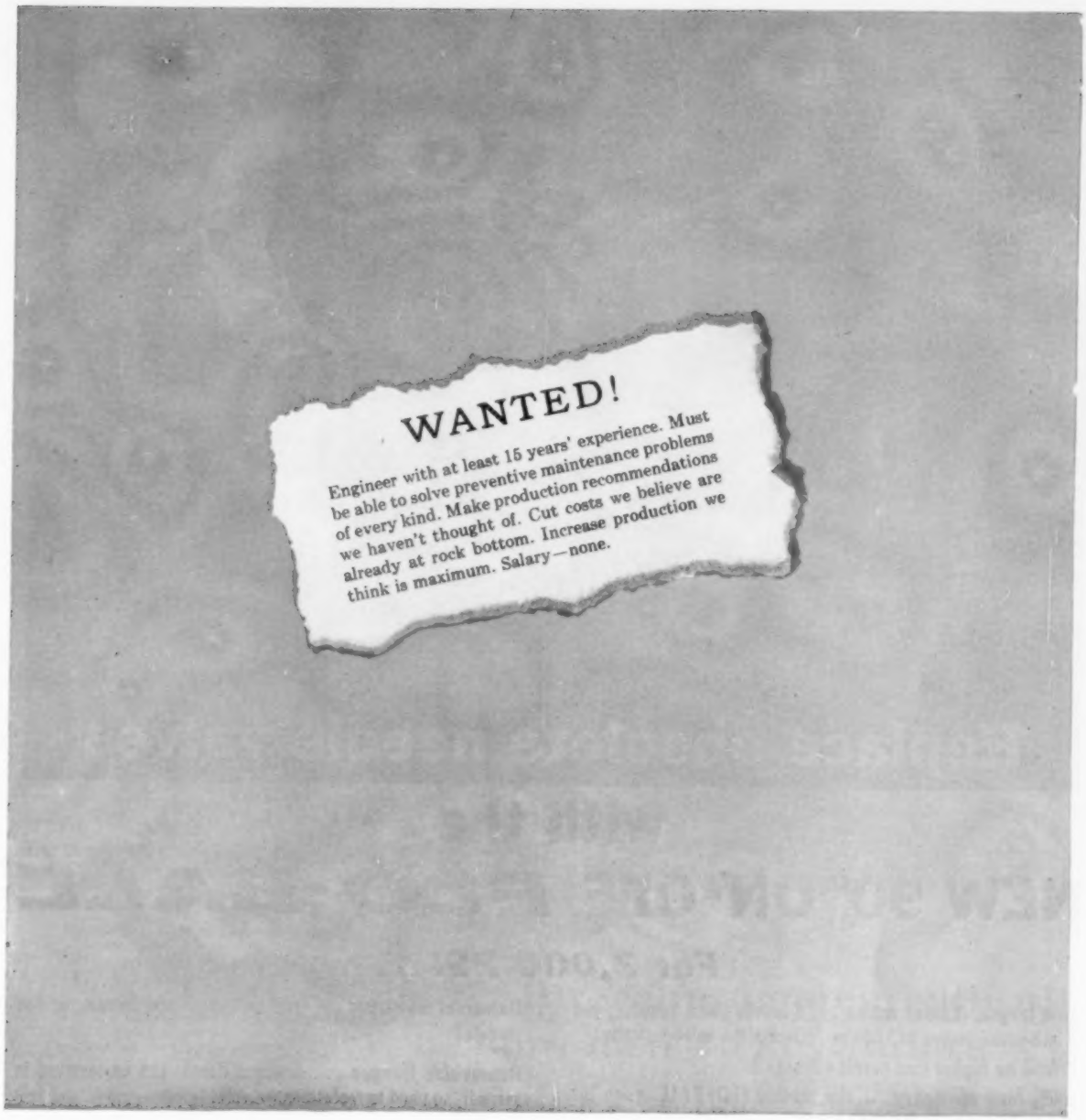
Superior Tube

The big name in small tubing

NORRISTOWN, PA.

All analyses .010 in. to ⅝ in. OD—certain analyses in light walls up to 2½ in. OD

West Coast: Pacific Tube Company, Los Angeles, California • FIRST STEEL TUBE MILL IN THE WEST


WANTED!
Engineer with at least 15 years' experience. Must be able to solve preventive maintenance problems of every kind. Make production recommendations we haven't thought of. Cut costs we believe are already at rock bottom. Increase production we think is maximum. Salary—none.

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There is a man who fits the above requirements to a "T". He's a Mobil lubrication engineer. His references include many of America's leading manufacturers. His thorough lubrication knowledge enables him to make preventive maintenance and production recommendations that can save thousands of dollars . . . *and actually have in hundreds of documented cases.*

He's at your service night and day when you select a Mobil Program of Correct Lubrication. Chances are you'll find his experience (over 17 years average), coupled with Mobil's comprehensive lubrication program, is an answer to today's continually rising production costs. Why not find out?

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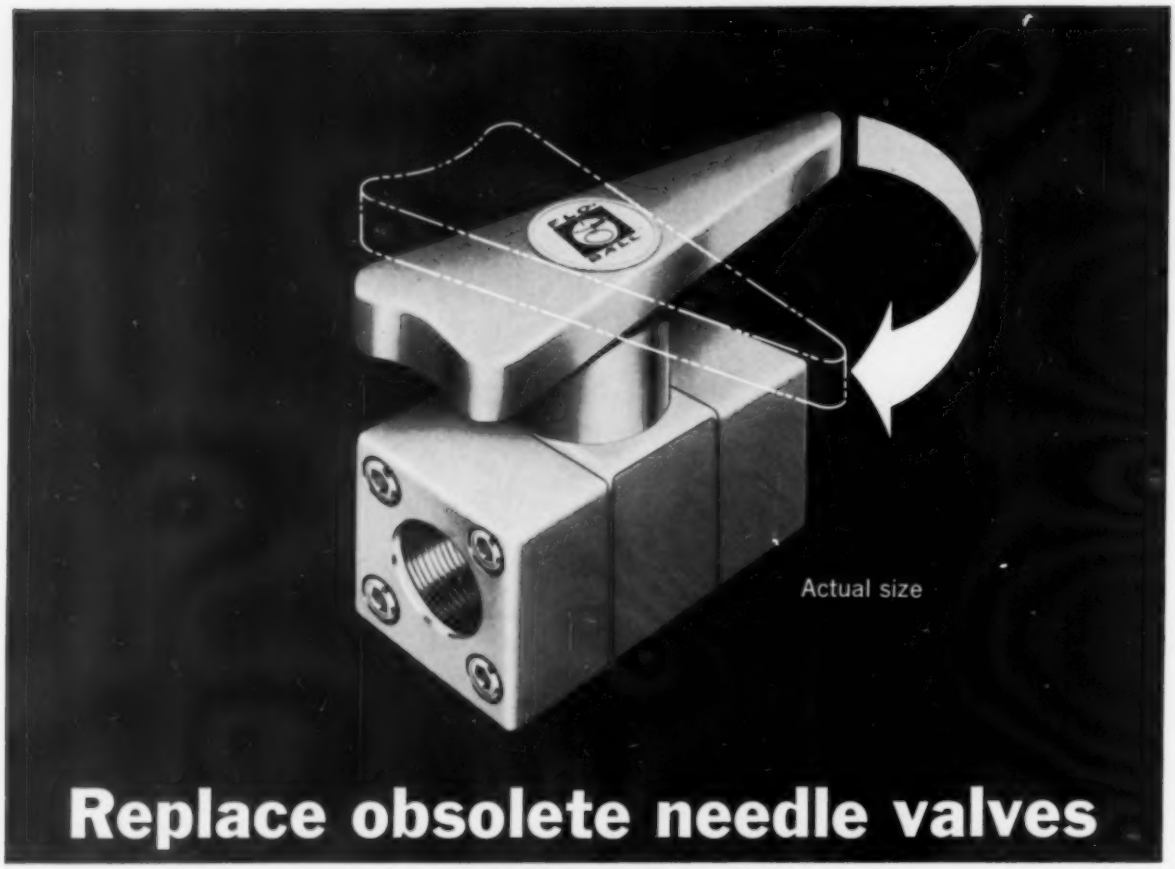

Replace obsolete needle valves with the NEW 90° ON-OFF FLO-BALL

For 3,000 PSI...

Low torque, instant action . . . a fast 90° turn, requiring just 4 inch-pound torque at 3,000 psi, actuates the valve instantly!

Priced no higher than needle valves!

100% flow efficiency . . . straight-thru ***FLO-BALL*** design has more than twice the flow efficiency of needle valves!

Positive ON-OFF indication . . . large arrow-shaped handle shows valve position at a glance!

Zero leakage . . . Mass Spectrometer tests with Helium prove zero leakage!

Universal mounting . . . can be panel, side, bottom, or line mounted!

Removable flanges . . . damaged flanges can be removed in seconds; no need to replace entire valve!

All stainless steel construction . . . costs no more than old fashioned screw-type valves!

Versatile service . . . ideal for leakproof control of air, vacuum, steam, water, fuels, oils, kerosene, alcohol, and many other fluids.

SERIES 715			
Port Styles and Sizes			
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Size	Part No.	Size	Part No.
⅛	715A1	¼	715A2
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Other models are available for service with cryogenic and corrosive media. Also special designs for throttling flow control.

Write today for new catalog describing the world's most complete line of precision valves for industrial and military applications.

FLO-BALL

Hydromatics, Inc.

LIVINGSTON, N. J. • WYMAN 2-4900 • TWX=LIVINGSTON, N. J. 120

Circle **90** *on Time-Saver Card*

interchangeable with all standard JIC cylinders

With the introduction of the ALL NEW T-J Squair Head, Tomkins-Johnson now offers industry the most complete design range of air and hydraulic cylinders. Presently available in bore diameters from 1½ to 8 inches, the T-J Squair Head is an interchangeable cylinder which produces maximum force and efficiency, with minimum pressures . . . and is also adaptable to the use of low pressure oil as the working medium. Write to The Tomkins-Johnson Co., Jackson, Michigan, for Bulletin #SQ 10-58 and complete details.

CHECK THESE 10 POINTS OF T-J SUPERIORITY

1 One Piece Piston

2 Hard Chrome Cylinder Bore and Piston Rods

3 High Tensile Steel Tie-Rods

4 Cushion Adjusting Screw, Externally Adjustable

5 New Super-Cushion for air, or Self-Aligning Master Seal for Oil (T-J Patents)

6 Solid Steel Heads and Mounting Plates Standard all Models

7 Port Design Allows Minimum Pressure Drop on Inlet or Outlet

8 Chevron Type, Self-Adjusting Rod Packing

9 Piloted Packing Gland—Absolute Alignment

10 Piston Rod, Extra Strong—Polished and Chrome Plated for Efficiency and Protection

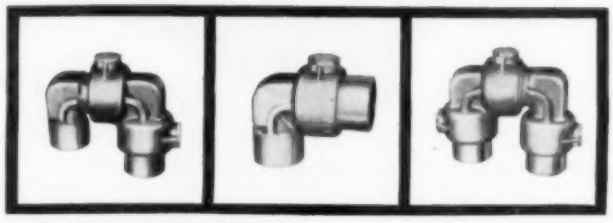
T-J TOMKINS-JOHNSON

PROBLEM: TORSION FATIGUE ON RUBBER HOSE

SOLUTION: **CHIKSAN SWIVEL JOINTS**

When twisting and kinking on hose lines present a torsion fatigue problem, look to Chiksan for a ready solution. Chiksan Swivel Joints, with free turning 360° rotation allow hose lines to be flexed without the twist caused by fixed position fittings. With Chiksan Swivel Joints hose lines last longer, maintenance and downtime are virtually eliminated.

Call on Chiksan, depend on Chiksan. Over 1000 different types, styles and sizes have been developed for pressures from 28" vacuum to 15,000 psi and temperatures of −70° to +225°F. A nearby representative is ready to analyze your requirements and make specific recommendations. Write today for his name.



Typical Chiksan Swivel Joints

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A SUBSIDIARY OF FOOD MACHINERY AND CHEMICAL CORPORATION fmc

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RACINE-SECO HYDRAULIC PUMPS

LOW PRESSURE—HIGH VOLUME
Model R Vane Type Pump 40 gpm— up to 1000 psi.

offer maximum performance and adaptability

HIGH PRESSURE—LOW VOLUME
Model LA Radial Piston Pump ½ to 20 gpm—up to 10,000 psi.

Tailored to fit the job . . . One source—one responsibility

FEATURES

VANE TYPE PUMPS

- ★ 5 to 70 gpm—up to 1000 psi
- ★ Variable volume for reduced horsepower consumption
- ★ Maintain pressure without costly waste of by-passing oil
- ★ Variety of governors available to suit your requirements

RADIAL PISTON PUMPS

- ★ ½ to 20 gpm—up to 10,000 psi
- ★ ISO-FLO design for several isolated flows from *one* pump
- ★ Isolated flows at one pressure or several pressures
- ★ Ideal for accumulator circuits and parallel feed of cylinders

Utilize our FREE Engineering Service for the most efficient and economical circuit. Write or call for complete descriptive data on RACINE-SECO Hydraulic Pumps and circuit components.

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RACINE HYDRAULICS & MACHINERY, INC.
2074 Albert Street RACINE, WISCONSIN

BRIEFS

about fluid power

HYDRAULIC DRIVE POWERS PRESS SECTION

A new sizing and smoothing press section, utilizing a variable displacement pump, constant displacement motor drive, is helping improve the finished surface of certain types and grades of paper.

The new section is inserted between the fourth press section and the first dryer section of a paper machine. The fluid motor which drives the new section is connected directly to its plasticizer roll. The pump which supplies this motor is driven from the first dryer roll following the new section.

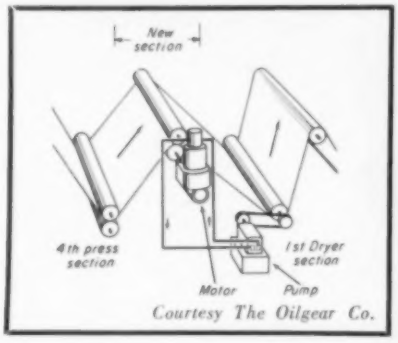
Therefore, speed of the plasticizer roll remains in the same ratio with the first dryer roll regardless of machine speed. It also remains stable within 6% regardless of load.

From a simple, remote, pushbutton station, the operator controls pump displacement and hydraulic motor speed by energizing an electric motor on the pump. This changes the speed ratio to precisely increase or decrease the tension on the paper.

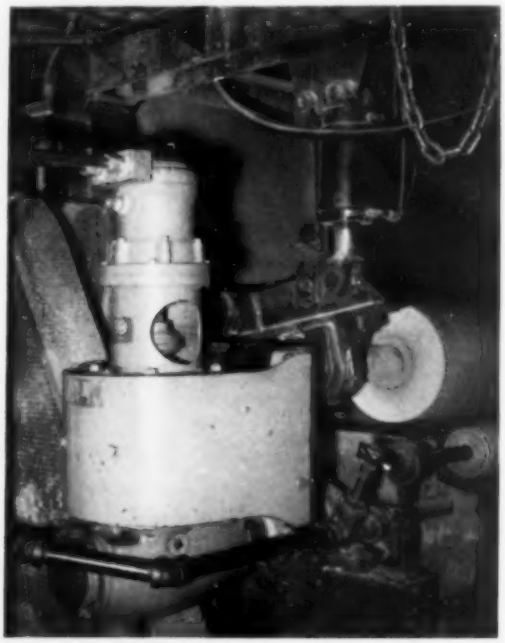
The control station also has pushbuttons for starting or stopping the new section while the rest of the machine continues to run. Gages indicate temperature and exact load on the drive at all times. □□□

Continued on page 30

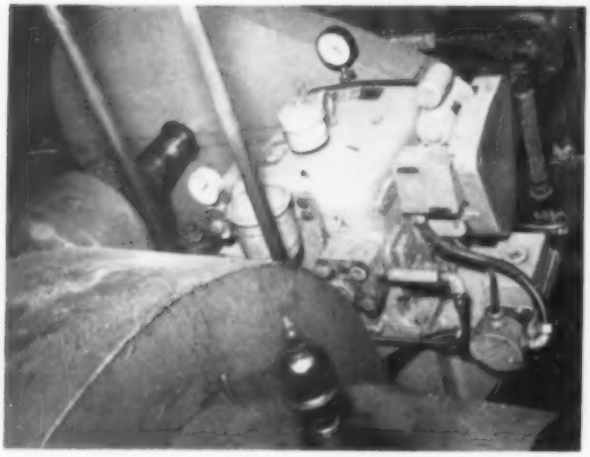
PUMP DRIVEN from first dryer section supplies drive motor speed of new section in direct relation to dryer section speed.



Courtesy The Oilgear Co.



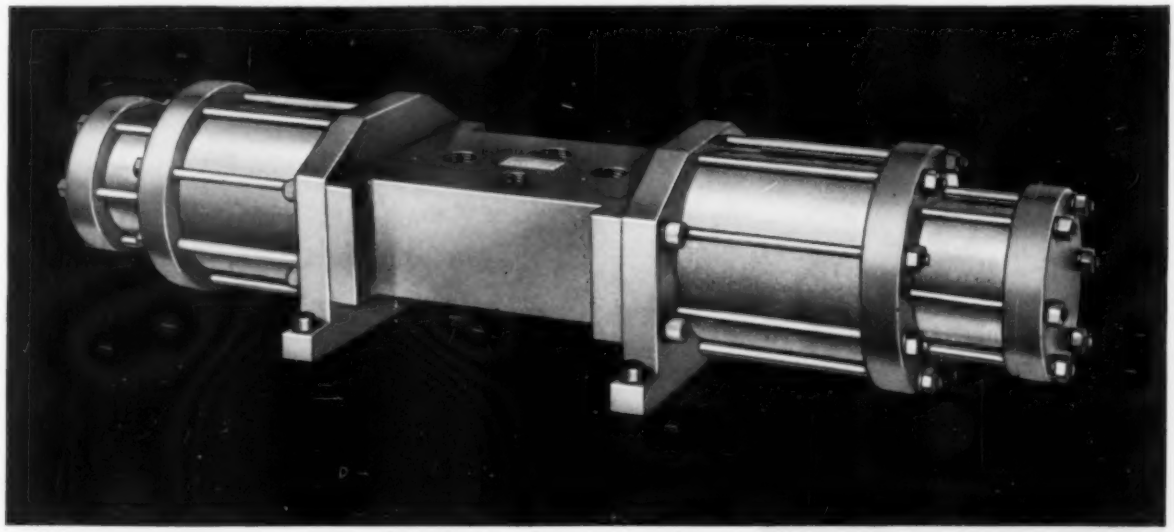
VERTICALLY-MOUNTED, MOTOR with right angle gear reducer is a direct, compact drive for new section.



VARIABLE DISPLACEMENT radial piston pump is controlled by electric motor. Two pushbuttons adjust speed for fine paper tension control.

HUNT
HYDRAULIC VALVES

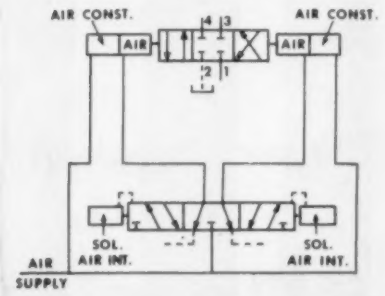
First Choice in the Steel and other Heavy Industries



Here's Why!

Over 20 years of specialized experience designing—and building—hydraulic operating valves for rugged industry requirements . . . ½" to 8" sizes . . . Zero leakage on water, soluble oil and water, or oil . . . Valves to meet any application . . . No metal to metal seating . . . Easy field maintenance . . . Inexpensive maintenance parts . . . For utmost dependability and service call the Hunt man.

1½" Three Position 4-way Air Pilot Operated 2000 p.s.i. Valve for Oil or Water Service. Other Designs to 5000 p.s.i. Control Circuit Diagram Below Shows Automatic Return to Mid Position.



More startling HUNT designs to come!

40 1919 1959 YEARS of Service

HUNT

Quick-As-Wink AIR AND HYDRAULIC CONTROL ***Valves***

Manufactured by HUNT VALVE COMPANY, 1992 East Pershing St., Salem Ohio

NOW AVAILABLE

STRATOFLEX

FLARED TUBE TYPE ELBOW FITTINGS AND ASSEMBLIES

For confined space installations where hose fittings of minimum dimensions are required

For complete information, write for Bulletin S-4 today.

Installation of hose assemblies in a confined space has long been an industry problem. To solve this problem, Stratoflex has developed a flared tube series of elbow hose fittings and assemblies.

Use of these Stratoflex assemblies eliminates the need for combinations of fittings and elbow adapters.

- Form tubing used for fabrication of fittings to allow uniform flow.
- Fittings available for medium and high pressure applications and for transmission of all fluids.
- All fittings are quality steel, quality controlled in manufacture.

SFD-0

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BRIEFS

Mobile Crane Gives Big Lift To Trucking Industry

A hydraulically operated, self-propelled vertical lift crane offers complete mobility for use by the trucking industry. It eliminates use of the highway tractor and trailer chassis for movement and storage of containers in terminal

holding areas, leaving highway rolling stock free for over-the-road use.

Development was by Seatrain Lines of New York and Travelift and Engineering Co. of Sturgeon Bay, Wisc. It's an adaption of a similar vehicle used as a lumber carrier.

Equipped with airplane type tires on each of the four tall legs, the lift straddles a trailer chassis, lifts freight vertically between its legs and can be driven anywhere without using rails, special paving, or tractor towing power.

Power is supplied by a 56 hp, air-cooled gasoline engine, and a 25-ton load can be carried at 10 mph. A man can control operation from a platform on one side. The lift can straddle a trailer and container nine feet wide. □□□

Gear Pump Powers Boat Steering

After several years of extensive trials, a new hydraulic steering unit designed to fit almost any small vessel was developed by Keelavite Hydraulics, Ltd., Coventry, England.

Power for the unit comes from a gear type hydraulic pump, which

Continued on page 32

Illustrated—Logansquare Cylinder Meets J.I.C. Standards

Look to Logan

the ultimate in air cylinder design

FREE SEND FOR THE "LOGAN CALCULATOR"
A gift to you from Logansport Machine Company upon request.

MEMBER: Natl. Mach. Tool Builders' Assn.; Natl. Fluid Power Assn.

LOGANSPORT MACHINE CO., INC.
832 CENTER AVENUE, LOGANSPORT, INDIANA

PLEASE SEND COPY OF CATALOG:

- ☐ 100-1 AIR CYLINDERS
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- ☐ 100-3 AIR-DRAULIC CYLS.
- ☐ 100-4 AIR VALVES
- ☐ 100-5 LOGANSQUARE CYLINDERS
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- ☐ FACTS OF LIFE
- ☐ 200-1 HYD. POWER UNITS
- ☐ 200-2 ROTOCAST HYD. CYLINDERS
- ☐ 200-3 750 SERIES HYD. CYLINDERS
- ☐ 200-4 and 200-7 HYD. VALVES
- ☐ 200-6 SUPER-MATIC CYLS.
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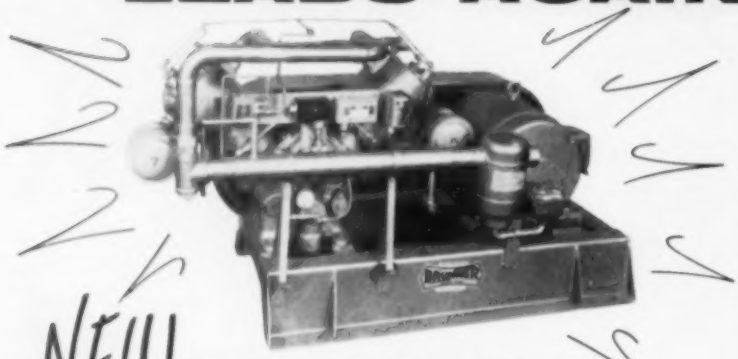
SINCE 1906

LEADS AGAIN



NEW **WATER COOLED AIR COMPRESSOR LINE**

Since 1906, Brunner has lead with the latest in air compressors. Now the WJ and WK (10 thru 30 HP) water cooled line joins the famous family of Brunner compressors from ¼ thru 50 HP.

6 good reasons why Brunner is preferred

BRUNNER Air Compressors:

- Are outstandingly dependable
- Provide oil and moisture free air
- Offer single or 2 stage equipment in all sizes
- Supply complete air or water cooled aftercooler assemblies with all fittings from one dependable source for all compressor sizes
- Provide "entire system" duplex units that are "operation readied" to connect to piping and wiring facilities
- Air conditioning and heating experience of Dunham-Bush engineers enables them to professionally assist in layout for dependable control systems.

ALSO WATER COOLED AFTERCOOLERS AND OTHER ACCESSORIES BY heat-x A DUNHAM-BUSH SUBSIDIARY

REQUEST:

- *Bulletin #763 for water cooled specifications*
- *Catalog #36 for ½ through 20 H.P. data*
- *Catalog #37 for 25-30-40-50 H.P. industrial information*

BRUNNER DIVISION
DUNHAM-BUSH, INC.
DEPT. AH. WEST HARTFORD 10, CONNECTICUT

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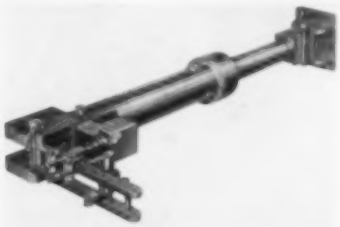
BRIEFS

may be driven from the main engines, some existing drive or by an entirely separate motor. The compact unit consists of a hydraulic cylinder with an integral control valve.

Operation of the cylinder is on the "compound connection" principle. Pressure is maintained constantly on the smaller, or annulus area, while the larger full bore



area is connected either to the pressure source or to the reservoir, as desired.

Pressure to both the annulus and full areas forces the cylinder rod outward; connecting the bore area to the reservoir moves the rod inward. This permits the valve mechanism to be reduced to its most simple and efficient form, since oil flows in or out only one side of the cylinder.

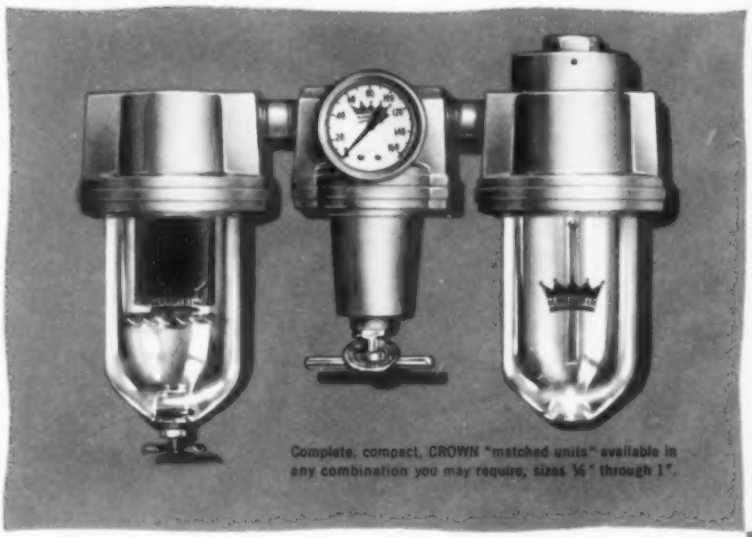
The presence of pressurized oil on both sides of the cylinder also eliminates any "slack" and gives instantaneous response throughout the cylinder travel. □□□

Continued on page 37

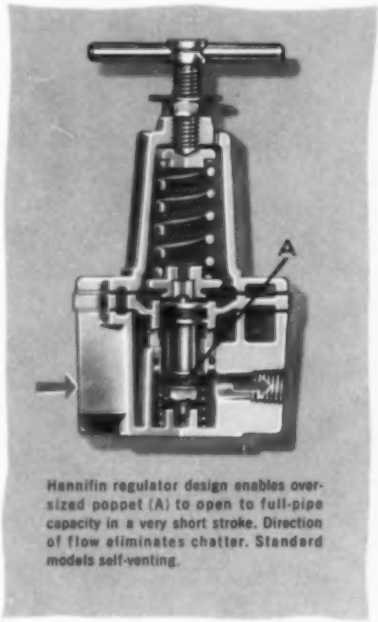
POWER HYDRAULIC STEERING and a hydraulic shiftable mold-board are two features of a recent addition to the Allis-Chalmers line of construction machinery. The motor grader is an 80 hp, 21,540-lb. unit. Power-operated leaning front wheels and a full 6500-lbs. of weight on the front axle give the new motor grader extra resistance to side thrust of big mold-board loads.

For Air Preparation Units Circle **78**
For Fittings Circle **125**

Crown From HANNIFIN air preparation units that don't waste air power



Complete, compact, CROWN "matched units" available in any combination you may require, sizes ¼" through 1".



Hannifin regulator design enables oversized poppet (A) to open to full-pipe capacity in a very short stroke. Direction of flow eliminates chatter. Standard models self-venting.

Hannifin CROWN "Combo" units – filters, regulators and lubricators in any combination – keep compressed air in the "pink of condition" without depriving you of needed air flow.

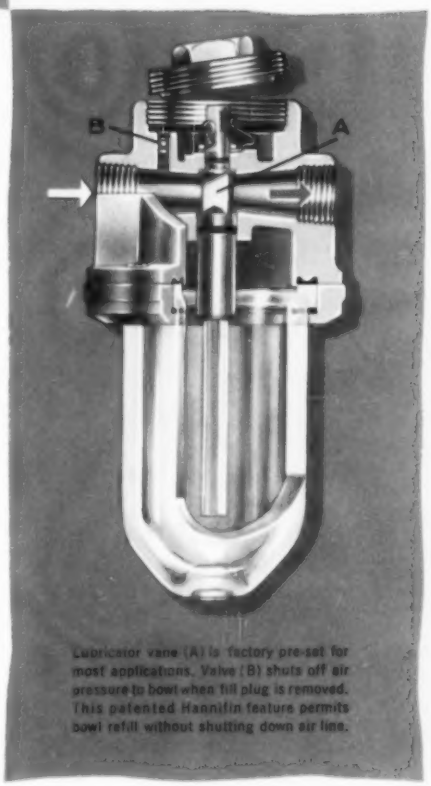
Crown regulators open fast on demand, close precisely when demand is satisfied, deliver the exact amount of air needed. Their "piston balanced" poppet design, which makes possible a flat, large-area, poppet-type valve with very short stroke, is the reason. The inherent stability of this design – no hunting or chatter – results in multi-million cycle life.

Crown filters have large, reusable filter elements for minimum resistance to air flow. Crown lubricators introduce predetermined amounts of oil into the air stream, automatically. Their design is so responsive to variations in air flow rate that the concealed, tamperproof adjustment is rarely used. This is the easiest lubricator of all to fill, and remote-fill models are available.

Crown units are competitively priced and stocked in principal industrial areas by Hannifin CROWN authorized distributors. For CROWN literature and the name of the distributor nearest you, write:

HANNIFIN COMPANY

535 South Wolf Road • Des Plaines, Illinois

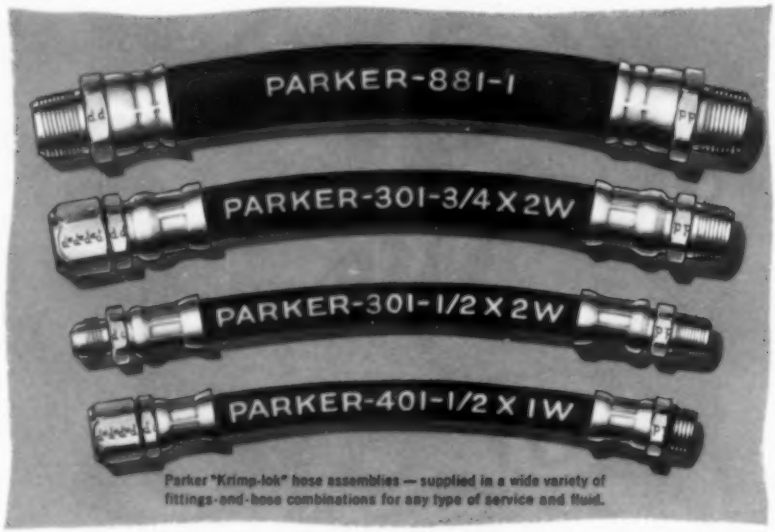


Lubricator vane (A) is factory pre-set for most applications. Valve (B) shuts off air pressure to bowl when fill plug is removed. This patented Hannifin feature permits bowl refill without shutting down air line.

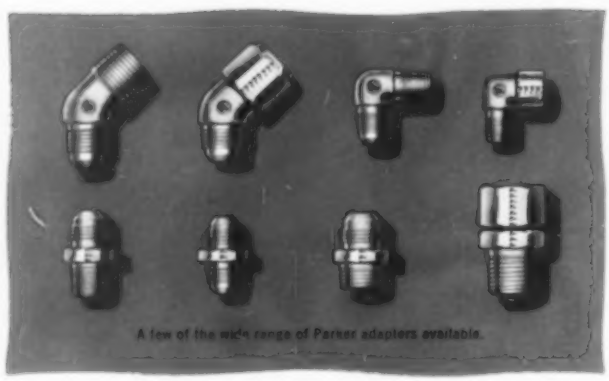
PARKER-HANNIFIN FLUID-SYSTEM COMPONENTS

Now from Parker

BOTH permanent-end and re-usable hose assemblies



Parker "Krimp-lok" hose assemblies — supplied in a wide variety of fittings-and-hose combinations for any type of service and fluid.


A few of the wide range of Parker adapters available.

You may require permanent-end hose assemblies for your production AND re-usable fittings with coils of hose for quick, trouble-proof replacements in the field. With the addition of Parker's new "Krimp-lok" fittings, permanent-end assemblies are now available from Parker. They use the same Parker hoses that enjoy a wide acceptance when used with Parker *no-skive* "Hoze-lok" fittings in the replacement field.

A full range of Parker adapters is also available.

Ask your Parker Hose Distributor, listed in the Yellow Pages, for engineering advice and literature on "Hoze-lok" re-usable fittings, also Parker hose and adapters. Write us in Cleveland regarding your requirements for Parker "Krimp-lok" Hose Assemblies.

Parker

FITTINGS AND HOSE DIVISION

17325 Euclid Avenue

Cleveland 12, Ohio

Parker "Hoze-lok" no-skive hose fittings and Parker hose, the ideal combination for short run production and quick, reliable field replacement.

A DIVISION OF PARKER-HANNIFIN CORPORATION

PARKER-HANNIFIN FLUID-SYSTEM COMPONENTS

Parker "Krimp-Lok" Hose Assemblies
(by Parker Fittings and Hose Division)
HANNIFIN Mobile Hydraulic Cylinders
(by Hannifin Company – division of Parker-Hannifin)
Parker Control Valves
(by Parker Hydraulics Division)

Time-saving service for mobile equipment builders...

3 PARKER-HANNIFIN HYDRAULIC CIRCUIT COMPONENTS

see them at the show in 1 booth
discuss them in your office with 1 salesman

At the Material Handling Institute Exposition, you will see a full range of high-precision Parker control valves known industry wide for fine metering, for delicate control of heavy loads. You will see Hannifin power cylinders that efficiently and speedily convert hydraulic power into load-moving linear motion. Also a complete display of new Parker "Krimp-Lok" permanent-end hose assemblies that round out the 3-in-1 Parker-Hannifin service.

Also, if you need seal information, Parker Seal Company will have Parker O-rings and the new Parker "Gask-O-Seals" and "Stat-O-Seals" in this same Parker-Hannifin booth.

If you can't make the show, a Parker-Hannifin sales engineer representing all three divisions serving the mobile equipment field will discuss your mobile hydraulic problems with you at your own office. Just write to E. C. Davis, Parker-Hannifin Corporation, 17325 Euclid Avenue, Cleveland 12, Ohio, to arrange for a visit from your

COME SEE US AT . . .
THE MATERIAL HANDLING INSTITUTE'S EXPOSITION
CLEVELAND AUDITORIUM
JUNE 9-12 1959

Booth No. 1510

PARKER-HANNIFIN
MOBILE HYDRAULIC SPECIALIST

REPRESENTING 3 DIVISIONS OF PARKER-HANNIFIN CORPORATION

← *For Air Preparation Units Circle* **78**
For Fittings Circle **125**

Circle **124** *on Time-Saver Card*

Only Parker piston hydraulic accumulators HAVE PATENTED 5-BLADE SEAL PREVENTS LEAK-BY EVEN DURING RAPID CYCLING

Parker patented 5-blade V-O Rings maintain full wall contact between piston and wall without rolling, even under rapid cycling. These seals also hold full pressure throughout long idle periods between cycles.

Use Parker Piston Hydraulic Accumulators wherever you want dependable, blowout-proof, full-pressure storage of hydraulic energy... or safe, reliable absorption of sudden pressure peaks in fluid systems.

Parker, with nearly 10 years experience in piston accumulators offers these field-proven advantages:

No sudden failures to cause work stoppage, because there's no bladder to rupture,

Replace the simple, low-cost seals (preventive maintenance) at your convenience,

Use in any position, even horizontal or upside down at temperatures from −40°F to +200°F,

Metal piston virtually eliminates osmosis of charging gas into oil, common with all-rubber separators,

Distributors in most industrial areas stock Parker Accumulators in sizes from 10-cubic-inch volume to 10-gallon, 2 inch ID to 7 inch.

Write for your copy of our 36-page catalog of accumulator specifications, design, dimensions and pressure data.

Parker HYDRAULICS DIVISION

17325 Euclid Avenue • Cleveland 12, Ohio

A DIVISION OF PARKER-HANNIFIN CORPORATION

BRIEFS

Drilling Units Aid Piston Machine Flexibility

Hydraulic drilling units form an important part of a new automotive piston machine designed and built by F. Jos. Lamb Co. of Detroit. The 10-station machine handles three different size pistons and machines 400 parts per hour. It is arranged so other operations can be added between any of the three main sections.

The drilling units are standard self contained hydraulic quill units, with boring and sawing spindles carried on hydraulic slides.

Other features of the machine include a central lubrication system and manifold mounted hydraulic components, all conforming to JIC standards.

Machine operation is completely automatic.

Two guide rods, which straddle

Continued on page 40

BRIEF NOTES

NEW SYNTHETIC ELASTOMER . . . A new, highly-fluorinated synthetic elastomer has been announced by the Chemical Division, Minnesota Mining & Manufacturing Co. Designed for use at 400 F, the elastomer may be used with a wide variety of corrosive chemicals, synthetic fuels, and functional fluids. Its manufacturer expects "Fluorel" to find broad application in fuel and hydraulic systems of aircraft and missiles.

NEW FABRICATION TECHNIQUE . . . Fusion welding, of Teflon allows assembly of one-piece lengths or configurations at substantially reduced costs. The resultant weld is a pure fluorocarbon with the same heat, chemical and electrical properties of Teflon, exhibiting excellent tensile strength and elongation. Used by the U. S. Gasket Co. of Camden, N.J., plastics division of The Garlock Packing Co., the new process removes many size limitations.

THE FIRST 100 . . . This year marks the 100th birthday of The Gardner-Denver Co. of Quincy, Ill. Robert W. Gardner, a Scottish immigrant engineer-inventor, opened his one-room machine shop and foundry in 1859. Today the company supplies primary equipment to the world's basic industries.

JET-AGE ORDER . . . Sanders Associates, Inc., of Nashua, N.H., have reported receiving orders totalling nearly one-half million dollars for precision electro-hydraulic components for use with the turbo-alternator drive, an electrical power plant of the B-52 Strato-fortress bomber. Orders were placed by the aircraft accessory turbine department of General Electric Co., Lynn, Mass., manufacturers of turbo-drives. Sales for Sanders for the first six months were up $175,359 over a similar period last year. Net income was $150,142 or 39 cents a share.

CURRICULUM CHANGE . . . Courses providing emphasis on engineering science rather than specialization in one field have been added at Lehigh University. Changes include the addition of material in heat transfer and flow of compressible fluids as part of the revision in the mechanical engineering curriculum. Total time devoted to thermodynamics has been upped from nine to 12 credit hours.

ADJUSTS WITH COLOR . . . Anodized aluminum gage discs give a visual check on a new adjustable needle type flow control valve. With each full turn of a micrometer knob in the "fast" direction, a colored disc is exposed. This novel feature allows quick and accurate resetting to a desired flow. Valve is a new product of Manatrol Corp., Cleveland, Ohio.

Cup Seals by LINEAR

in Viton A, Vyram, Polyurethane, and other unusual elastomeric materials having excellent resistance to many petroleum oils, synthetic lubricants, fuels, phosphate and silicate ester fluids—in a temperature range of —40° to + 500°F.

LINEAR—specialists in close-tolerance molding in all of today's modern polymers . . . in both fabric reinforced and homogeneous materials.

These are low friction seals. For further help, call the LINEAR engineer.

"PERFECTION IN RUBBER"
LINEAR
LINEAR, Inc., STATE ROAD & LEVICK ST., PHILA 35, PA.

Circle **104** on Time-Saver Card

WE SHRUNK EVERYTHING...EXCEPT PERFORMANCE

Now you can save up to 50% in piping costs in high-pressure applications—with this new smaller and lighter flange

Now, for the first time, the long-standing problem of how to fit heavy and bulky flanges into the complex configurations of today's high-pressure piping systems has been solved. Equally important, this new stainless steel flange by Accessory Products actually handles pressures *equivalent* to those being handled by standard ASA flanges...*at a tremendous saving in cost!*

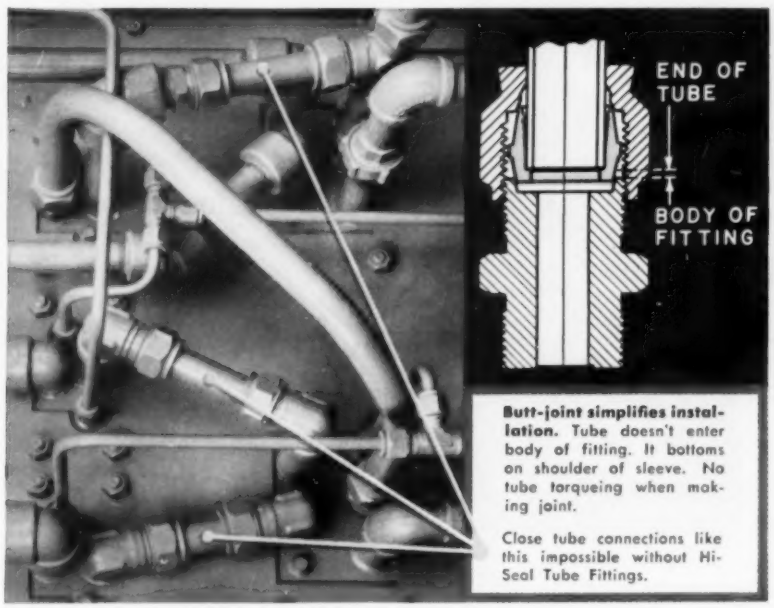
Available in line sizes from 1/4 inch through 2 inches, priced from $30 to $65—your choice of weld-neck, male pipe thread special high-pressure male adapters, and blind flanges. These flanges provide the ultimate in low-cost, compact, and reliable connectors for all high-pressure piping applications. For the complete story and specifications to meet your piping needs, write for Design Bulletin DB-159. Our engineers will be happy to discuss your specific applications.

APCO **ACCESSORY PRODUCTS CORPORATION**

a division of textron corporation / 616 West Whittier Blvd., Whittier, Calif. Phone: OXford 3-3747

IMPERIAL Engineering and Data File

ENGINEERED TUBE FITTINGS — VALVES — TUBING TOOLS



Butt-joint simplifies installation. Tube doesn't enter body of fitting. It bottoms on shoulder of sleeve. No tube torqueing when making joint.

Close tube connections like this impossible without Hi-Seal Tube Fittings.

Far more compact hydraulic piping layout made possible by Hi-Seal butt-joint tube fittings

This hydraulic power unit built by Scott Equipment Company, Dayton, Ohio, shows how Hi-Seal flareless tube fittings create new piping design opportunities.

Because of Hi-Seal's *positive butt-joint feature* which requires no tube entry into fitting, Imperial Hi-Seal makes possible far more compact piping layouts than would be obtained with other fittings. In addition the butt-joint design eliminates the need to spring tubing . . . a big advantage when working with large-diameter, heavy-wall or hard-temper tubing.

Important, too, there is only one way to put the Hi-Seal fitting together. No chance of sleeve being put in backward. And Hi-Seal fittings can be disconnected and reconnected as often as desired with assurance of original pressure-tight seal! It's the ideal fitting for hydraulic and other services where higher pressures are encountered. Meets J.I.C. and A.S.M.E. Standards. Available in Steel, Stainless Steel and Brass.

Write for Bulletin No. 3061

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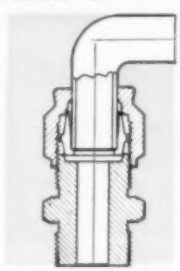
Limited space no problem for Hi-Seal fittings

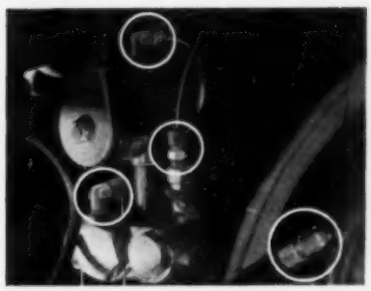


Because no flaring is necessary, and because of its butt joint, this fitting permits bends to be made exceptionally close to the end of the tubing . . . a major design advantage where space is limited.

IMPERIAL

THE IMPERIAL BRASS MFG. CO.
6300 W. Howard St., Chicago 48, Illinois
In Canada: 18 Hook Ave., Toronto, Ontario

Make huge time and labor savings with Poly-Flo tube fittings



New Lindsay All-Automatic Water Softeners employ Imperial Poly-Flo tube fittings and polyethylene tubing in the saturated brine lines in recharging these water softeners.

It is in units like this that Imperial Poly-Flo fittings make possible big savings in time and money. Polyethylene tubing bends readily by hand. No mechanical flaring or bending. Fittings need only be finger-tightened. Wrenches or other tools are never necessary.

Imperial Poly-Flo tube fittings hold burst pressure of polyethylene tubing and are ideal for applications involving conduction of most types of gases and liquids.

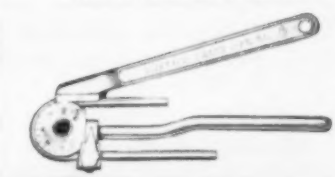
Write for Bulletin No. 3025

• • • • • •

Tube Bender for hard or soft tubing

Bend hard and soft drawn copper, steel, aluminum, thinwall conduit; even stainless steel tubing. Won't mar or flatten tubing. Calibrated for bending any angle to 180°. Sizes for ⅛" to ⅞" O. D. Tubing.

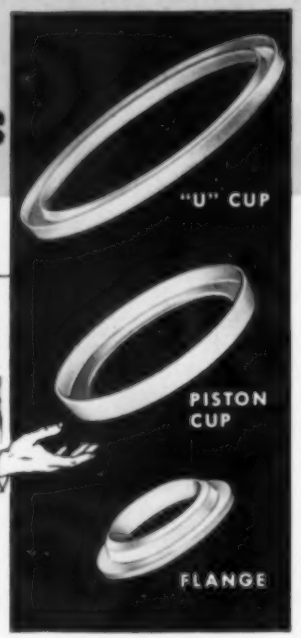
Write for Bulletin No. 3088



CONTACT YOUR INDUSTRIAL DISTRIBUTOR OR WRITE TO:

THE IMPERIAL BRASS MFG. CO.
Dept. AH-59, 6300 W. Howard St.,
Chicago 48, Ill.
Please rush me:
Bulletins ☐ No. 3061 ☐ No. 3025 ☐ No. 3088
Name .....
Title .....
Company .....
Street .....
City ..... Zone ..... State .....

Why Use Less Than Chemlon* Packings In Your Hydraulic Cylinders



Hydraulic equipment manufacturers are now taking a *second* look at the many advantages of "John Crane" CHEMLON hydraulic packings and offering them in place of leather, fabric-reinforced and similar packings.

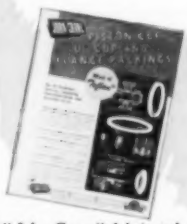
THE REASON . . . CHEMLON provides several very important service advantages.

1. Increased cylinder life due to the inherent non-frictional qualities of CHEMLON.
2. Longer packing service life—CHEMLON outlasts all other types of packing to a remarkable degree . . . decidedly cuts replacement, down time and maintenance.
3. Universal application—CHEMLON'S inertness to all types of hydraulic fluids, including non-flammables and synthetics . . . eliminates the need for customers stocking a wide range of special packings.
4. Trouble-free performance—CHEMLON withstands temperature conditions encountered in hydraulic service up to 350°F.

"John Crane" CHEMLON–*The Best in Teflon*–offers a complete line of piston cup, "U" cup and flange packing for every service requirement.

Get the new bulletin No. P-322 on "John Crane" Hydraulic Packings.

Crane Packing Co., 6405 Oakton St., Morton Grove, Ill. (Chicago Suburb). *In Canada: Crane Packing Co., Ltd., Hamilton, Ont.*



*"John Crane" fabricated from DuPont Teflon

John Crane

MECHANICAL PACKINGS | SHAFT SEALS | TEFLON PRODUCTS | LAPPING MACHINES | THREAD COMPOUNDS

CRANE PACKING COMPANY

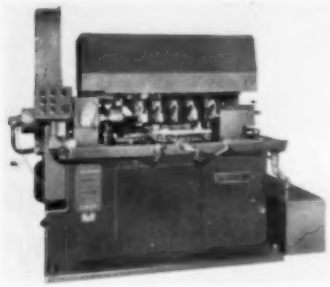
Circle **41** on Time-Saver Card

BRIEFS

the skirt extensions, maintain orientation the length of the machine. Circular jaws clamp the parts at the machining stations and a walking beam type transfer mechanism moves the parts through the machine. □□□

Die Casters Discuss F-R Fluid

Five representatives from major producers of fire resistant hydraulic fluids met in Cleveland March 17 to discuss the advantages of using fire resistant fluids in die casting machines. The panel was sponsored by the Cleveland chapter of the Society of Die Casting Engineers.



AN AIR OR HYDRAULIC chuck is a feature of the new Footburt-Schraner Model SFA completely automatic machine for lapping or roll burnishing bearing surfaces on straight shafts or camshafts. Equipped with automatic loading and unloading devices, the machine handles shafts to 36-in. long, and with a maximum o.d. of 12 in.

Speakers were Thomas Smith, Celanese Corp.; Dale Smith, Monsanto Corp.; Charles Schmidt, E. F. Houghton & Co.; William Millett, Union Carbide & Carbon Co., and Robert Holmes, Shell Oil Co.

Highlights of the discussion were the improvements in water-base, phosphate-ester, and oil-water emulsion fluids, since they were first introduced.

The higher cost of phosphate-ester fluids was justified by their

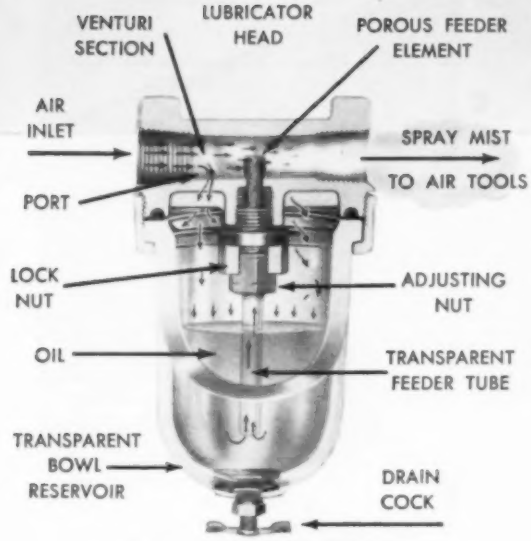
Continued on page 42

Circle **13** ➡

Arrow AIRLINE SPRAY MIST LUBRICATORS

Supply a fine Spray Mist Lubricant by the most efficient and effective two-stage method!

By PRE-DIVIDING or breaking up the oil in the first stage before completely atomizing the Lubricant in the second stage. The Spray Mist is then carried along throughout the entire pattern of the air stream to lubricate the working parts of air-powered tools, cylinders, valves and other pneumatic devices.



Illustrates the operation of the ARROW "patented" two-stage, tamper- proof Lubricator.

Compressed air from the drop line enters the Lubricator to Venturi section of the Lubricator Head where the porous feeder element protrudes into the Air Stream.

Small ports in front of the porous feeder permits air pressure transfer on the oil surface in the bowl reservoir. The pressure differential created by the Venturi forces the oil to rise in the transparent feeder tube, into and through the porous feeder element which PRE-DIVIDES the Lubricant in this first stage, into minute particles of oil.

The Lubricant now finely divided and saturating the porous feeder element, is now easily and most efficiently atomized from the feeder element, at this second stage, by the action of the Venturi on the compressed air passing through the Lubricator Head.

The two-stage method incorporated in the ARROW LUBRICATOR insures a fine spray mist for wider ranges of AIR FLOWS at lower pressure drops.

Simplicity of design with only one tamper-proof adjustment provides for most efficient, low-cost operation.

PROTECT YOUR PNEUMATIC EQUIPMENT

Complete Conditioning and Control of Compressed Air Prolongs Service Life, Reduces Maintenance and Repair of Air-Powered Tools, Cylinders, Valves and Other Pneumatic Equipment.

the most Efficient and Complete AUTOPNEUMATIC CONTROL By Arrow

A choice of fine or coarse grade porous Bronze Feeder Wick as required for lubricant or application. A choice of Hand Filling Type Lubricator or a Pressure Filling Type with Button Head Fitting or the ARROW . . . New Fully Automatic Filling Type which with the Automatic Drain Trap makes Autopneumatic Control completely automatic, eliminating all hand or manual servicing.

Many Types and Models of Single Units and Units in Combination Assemblies to Meet Specific Requirements.

PIPE LINE SIZES—
¼"—⅜"—½"—¾" and 1" N.P.T.

Catalog and Engineering Data Sent on Request.

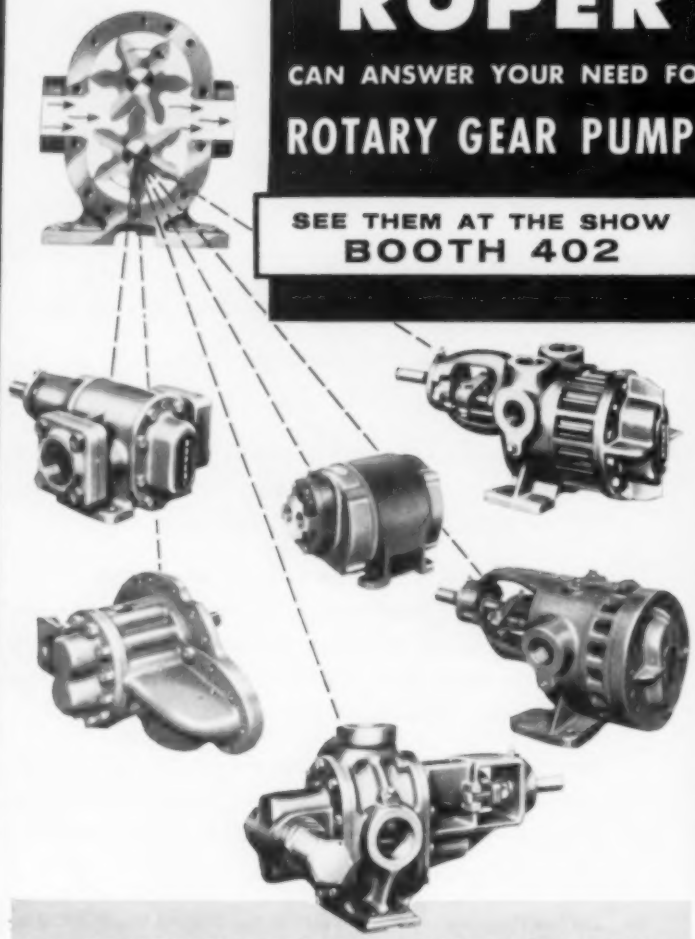
ARROW TOOLS, INC. 1934 S. KOSTNER AVE. CHICAGO 23, ILL.

ROPER

CAN ANSWER YOUR NEED FOR

ROTARY GEAR PUMPS

SEE THEM AT THE SHOW
BOOTH 402



A COMPLETE LINE OF STANDARD PUMPS
Plus SPECIAL AND CUSTOM PUMPS
TO MEET YOUR SPECIFICATIONS

CAPACITIES .3 TO 300 GPM
PRESSURES TO 1000 PSI

Send For Booklet
"How to Solve Pumping Problems"
or ask for a copy at the Design Show

ROPER HYDRAULICS, INC.
705 Blackhawk Park Avenue
Rockford, Illinois

ROPER
ROTARY PUMPS

Circle **143** on Time-Saver Card

BRIEFS

high stability. Installations were cited where the fluid has been in service for more than five years with no evaporation or breakdown.

Thorough cleaning of the system and removing all paint from the reservoir was stressed as a *must* for preparing existing equipment for F-R fluid. Compatible packings were recommended for use with the various fluids.

Panel members emphasized that if the hydraulic system is kept clean, component life will equal the life of components used in petroleum oil systems. □□□

TWIN CYLINDERS provide equal force for bending in either direction on the No. 92 Reinforcement Bar Bender. A super-strength roller chain transfers the power of the cylinders to the shaft. Bars are bent to 2⅜-inch round capacity at about 7 rpm. Two features of the machine, built by Wallace Supplies Mfg. Co., Chicago, is the elimination of turning the bar end for end in making double offset bends, and a speed control valve permitting hi-carbon bars to be bent. A degree-of-bend selector has 4 adjustable stops in each direction and can be pre-set. The 30 hp motor may be wired for either 220 or 440 volt, 3-phase, 60-cycle ac.

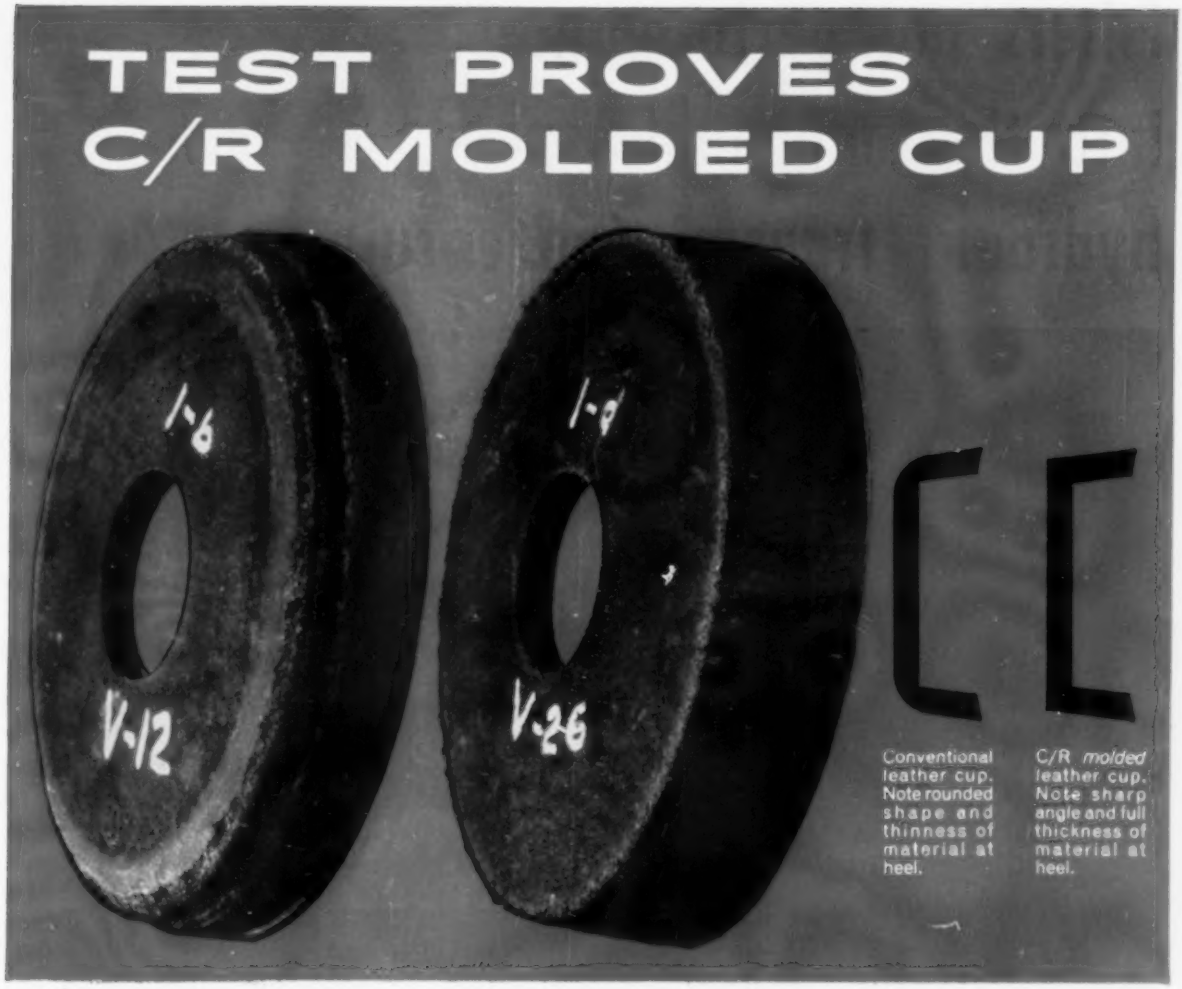
Butyl Packings Stop Leakage

Butyl rubber packings are solving leakage problems in applications where fire resistant phosphate ester-based hydraulic fluids are used. Butyl's great resistance to rubber-destroying characteristics of these fluids is the answer.

One application was in the Tennessee plant of an aluminum company. Here, a 250-ton hydraulically operated wheel type press, operating at pressures 500 to 1500 psi, is used to straighten heat-distorted rectangular steel smelter pot shells.

Continued on page 46

TEST PROVES C/R MOLDED CUP


V-12
V-26
Conventional leather cup. Note rounded shape and thinness of material at heel.
C/R molded leather cup. Note sharp angle and full thickness of material at heel.

New molded C/R cups* stand up longer... cut down replacement costs

Compare the wear on these piston cups shown in the unretouched photographs above. They were tested in a hydraulic cylinder at 6000 p.s.i. for 3000 cycles. The one at the right is a Sirvis-Conpor molded leather cup. The other is a conventional leather cup. Features of the C/R molded cup that make it so obviously superior are greater density, the sharp, rather than rounded heel, and the fact that it is pre-formed to the shape which conventional cups are forced to assume under pressure. This eliminates operational stress and flexing that conventional cups undergo, and contributes greatly to longer service life.

Right now, molded C/R cups are providing greatly increased service life in hydraulic cylinders in such heavy duty applications as farm and road building equipment and steel mill equipment at oil pressures up to 3500 p.s.i., and 150 p.s.i. in air cylinders. If you face a difficult packing problem that requires high durability and efficiency . . . it will pay you to consider this new, improved C/R design.

*Available in J.I.C. standard and other popular sizes. Write for complete size list.

CHICAGO RAWHIDE MANUFACTURING COMPANY
1203 Elston Avenue Chicago 22, Illinois

Offices in 55 principal cities. See your telephone book.

In Canada: Distributed by Chicago Rawhide Mfg. Co. of Canada, Ltd., Brantford, Ontario

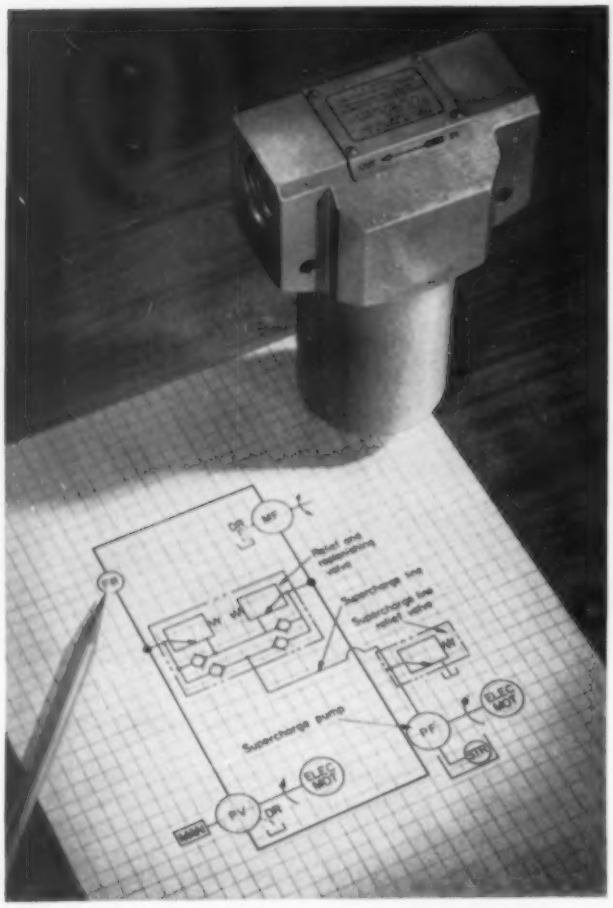
Export Sales: Geon International Corp., Great Neck, New York

SIRVIS C/R DIVISION
CHICAGO RAWHIDE

Other C/R Products

C/R Shaft & End Face Seals • Sirvene (synthetic rubber) molded pliable parts • C/R Non-metallic Gears

Filters put performance into this adjustable-speed hydraulic transmission circuit



For applications requiring any combination of torque and horsepower characteristics, an adjustable-speed hydraulic transmission consisting of a variable-delivery pump and variable-displacement fluid motor is generally used. In a reversing adjustable-speed hydraulic transmission circuit, either pump line may be the intake side. This type of transmission can be used to advantage in applications requiring a wide speed range. Over-all efficiency for this type of hydraulic transmission is approximately 85 per cent for all output speeds greater than 30 per cent of maximum.

In development of variable-speed transmission circuits, the rules and factors governing the design of hydraulic circuits in general apply. Protection of hydraulic fluid from contamination is essential for dependable performance of the circuit. And Purolator filters provide the most effective protection available today. The unit shown (PR-412-8) is used in many circuits like that above. It has military approval for 3000 psi service. It is part of a series offering a range in nominal rated capacity from ½ to 12 gallons per minute. Differing in relief valve design, the more recent types comply with MIL-F-5504A. The case can be unscrewed and removed for replacement of the element without disturbance to connections. To improve your hydraulic system, get precisely the filter you need by contacting Purolator.

THIS CIRCUIT incorporates a supercharge pump and a reversible replenishing system. Supercharging increases capacity of the main pump by maintaining pressure at the pump inlet and removing the possibility of cavitation at high flow rates. The supercharge pump has its own relief valve which limits inlet pressure to the main pump to approximately 150 psi. The relief and replenishing valve is a single unit which because of the arrangement of the check valves admits fluid to the system on the low-pressure side of the main pump but does not permit fluid pressure to be lost from the high-pressure side despite flow reversal.

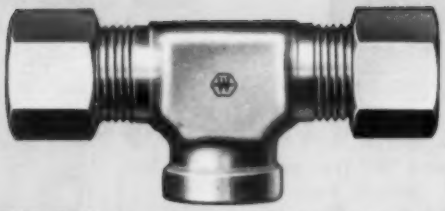
Filtration For Every Known Fluid

PUROLATOR

PRODUCTS, INC.

Rahway, New Jersey and Toronto, Ontario, Canada

Circle **135** on Time-Saver Card



ERMETO® HYDRAULIC TUBE FITTINGS

NO FLARING • NO THREADING • NO WELDING • NO SOLDERING

Steel and stainless steel Ermeto fittings in sizes and types to meet any high-pressure need. Also straight-thread Ermeto fittings with metal back-up washer to meet new S.A.E. specifications. All 7000 Series straight-thread Ermeto fittings and components have corrosion-resistant "Weathercote" finish.

FOR HIGH PRESSURE APPLICATIONS !

WEATHERHEAD

STEEL TUBE FITTINGS

WRITE FOR CATALOG

THE WEATHERHEAD CO., FORT WAYNE DIVISION

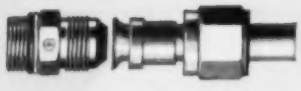
Dept. AH-5, 128 West Washington Blvd., Fort Wayne, Indiana

In Canada: The Weatherhead Co., Ltd., St. Thomas, Ontario

FLARE-TWIN* HYDRAULIC TUBE FITTINGS

S.A.E. 37° Flare-Twin (J.I.C.) fittings are available with Dryseal-thread or with new straight-thread (with metal back-up washer) in popular styles and sizes to meet S.A.E. "O" ring specifications. Available with cadmium-plate or new corrosion-resistant Weathercote finish.

**Trade name for the new Weatherhead 37° flared fittings.*



3-PIECE TYPE

2-PIECE TYPE

Offered you...

...by the world's largest builders of hydraulic jacks

PRECISION-ENGINEERED PRECISION-MACHINED INDUSTRIAL HYDRAULIC EQUIPMENT

Low Cost,

Manual Pump

for Agricultural or Light Industrial Equipment

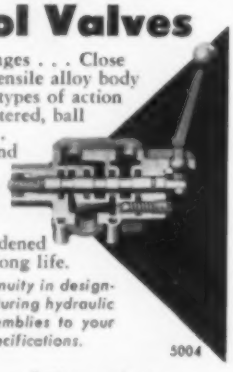
Stroke 2⅜" ... Maximum Operating Pressure 1500 PSI ... Fluid Capacity one gallon with tank 2/3 full ... Weight 22 lbs. ... Overall Height 21" ... Handle Length 20" overall. 17½" pipe handle ... Mounted as you require.

Pump-Motors

Function as both pumps and motors ... Forced lubrication and internal bleeding provide axial balance and eliminate high pressures against oil seals ... Rotation in either direction ... Heavy-duty roller bearing ... Small cube space ... 8, 17, 25 GPM at 1000 PSI ... Gear type, constant displacement.

Control Valves

Large oil passages ... Close grained, high tensile alloy body castings ... 2 types of action ... Spring centered, ball detent hold ... Hardened ground spool ... Precision honed valve body ... Pressure relief valve ... Hardened seat insert for long life.



Engineering ingenuity in designing and manufacturing hydraulic systems and assemblies to your own exacting specifications.

5004

Hein-Werner Corporation

Please write to

HEIN-WERNER CORPORATION

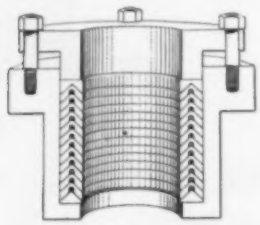
Waukesha 4, Wisconsin

Circle **80** *on Time-Saver Card*

BRIEFS

Originally a special duck and rubber compound "V" type packing was used. Serious leaks developed around the stuffing box which could be stopped on the outward stroke by tightening the packing gland. However, this tightening caused excessive binding of the packing on the ram which made the counterweight type pull-back ineffective.

Application of the duck reinforced butyl, consisting of top and bottom adapters separated by C-rings, brought the leakage under



Courtesy Garlock Packing Co.

full control and permitted the use of the counterweight pull-back by adding a simple air cylinder. □□□

Continued on page 48

Air Controlled Doors Speed Cattle Auction

Timing during the presentation of livestock during an auction is important. Auctions move fast, and the auctioneer's equipment must be geared to the same pace. He must have complete control of quick-opening doors for the cattle to enter and leave the auction arena. Beckett-Harcum Co. designed such a system for Producers Livestock Association, Wilmington, Ohio.

Cattle are first herded into a scale room where they are weighed. When the auctioneer is ready for the cattle he presses a switch. Double-acting cylinders extend and swing open the doors, allowing the cattle to enter the auction arena. Pressing another switch reverses the 4-way solenoid valve, and closes the doors.

After livestock have been sold, the auctioneer opens another set of air-operated, swinging doors for the cattle to pass out of the arena.

The two cylinders that operate each set of swinging doors are piped in parallel. One 4-way valve operates each pair of doors. Flow control valves at the cylinder ports regulate door opening and closing speed. They also help synchronize the door-opening cylinders.

A switch in the scale room is wired in series with the auctioneer's door-opening switch. This prevents opening the doors to the auction arena before the weighing is completed. □□□

AIR COMPRESSOR for operating the cylinders is mounted on a platform above the doors. Air valves and cylinders are attached to the top of the scale rack.

AIR CYLINDERS open and close double doors on each side of the auctioneer's platform. The auctioneer presses switches that actuate 2-position, 4-way solenoid valve to extend and retract the door operating cylinders.

NEW!

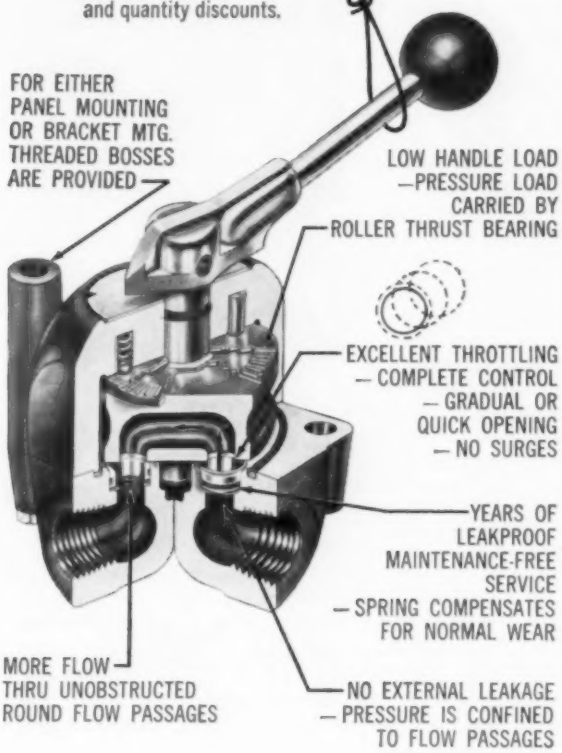
A "SHEAR-SEAL" VALVE

for LESS than a spool valve

RATED FOR 3000 P.S.I. OIL SYSTEMS

$65.00
List Price*
for a ¾" valve

*Less the usual O.E.M. and quantity discounts.


FOR EITHER PANEL MOUNTING OR BRACKET MTG. THREADED BOSSES ARE PROVIDED
LOW HANDLE LOAD —PRESSURE LOAD CARRIED BY ROLLER THRUST BEARING
EXCELLENT THROTTLING — COMPLETE CONTROL — GRADUAL OR QUICK OPENING — NO SURGES
YEARS OF LEAKPROOF MAINTENANCE-FREE SERVICE — SPRING COMPENSATES FOR NORMAL WEAR
MORE FLOW THRU UNOBSTRUCTED ROUND FLOW PASSAGES
NO EXTERNAL LEAKAGE — PRESSURE IS CONFINED TO FLOW PASSAGES

For complete data on this new valve and for information on all your valve requirements write for Catalog V-59-60

CONTROL VALVE DIVISION

Barksdale valves

5125 ALCOA AVENUE • LOS ANGELES 58 • CALIFORNIA

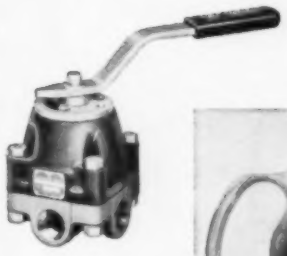
Circle **19** on Time-Saver Card

For High Pressure (to 6000 P.S.I.)

MANUAL WATER VALVES

that last

Specify "SHEAR-SEAL" design



4-Way, Manipulator, Dual pressure and Shut-off Valves from ¼ to 1½" N.P.T.

Note the mirrorlike sealing surfaces on this Dual Pressure Valve rotor after 4 years of service.

On extrusion presses, die casting machines, rubber and plastic molding presses and on blowout preventers, they have performed without maintenance longer than any other type of valve.

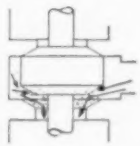
This LONG, MAINTENANCE-FREE SERVICE is possible because the metal-to-metal sealing surfaces are self-aligning and actually improve with use through continued lapping action. Sealing qualities do not diminish because a spring compensates for the wear.

DIRT CANNOT SCORE SEALS because flow is through "Shear-Seals," sealing surfaces remain in constant intimate contact.

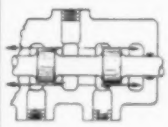
COMPLETE CONTROL OF YOUR CIRCUIT because "Shear-Seal" design is excellent for throttling. It permits opening to any desired degree of flow with smooth action and without fighting fluid pressure.

The "Shear-Seal" action eliminates line surges and the round tubular flow passages provide more flow and velocity capacity (up to 60 ft. per sec.) because they are unobstructed by spools or poppets.

This is why we don't use **SPOOL OR POPPET DESIGN**



Poppets score



Spools leak

Write for Catalog V-59-60

CONTROL VALVE DIVISION

Barksdale valves

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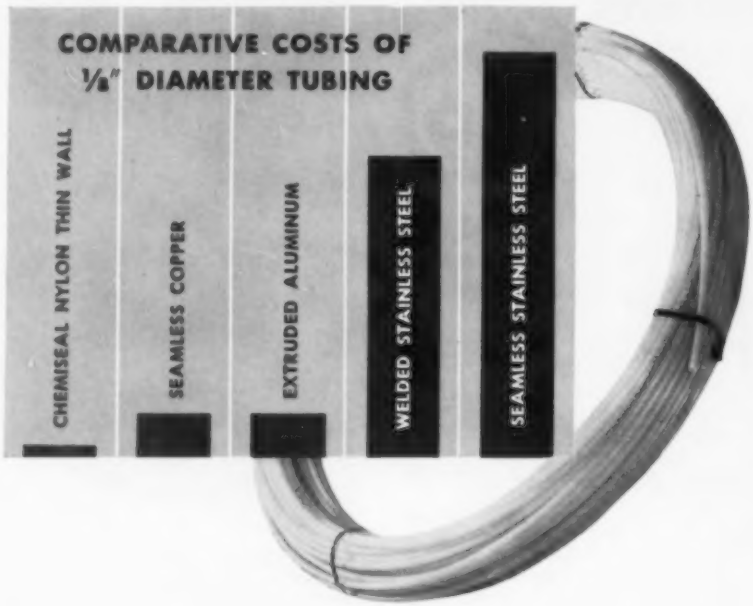
Chemiseal®

NYLON PRESSURE TUBING COSTS LESS... *Performs Better than Metal*



A decisive cost advantage of CHEMISEAL Nylon Pressure Tubing is shown in this graphic relationship to other tubing materials. Seamless copper and extruded aluminum cost approximately four times as much, while welded and seamless stainless steel costs 29 to 37 times more, respectively. Also, the cost of couplings and installation labor should be considered—CHEMISEAL Nylon Pressure Tubing needs no intermediate couplings or fittings . . . is simple to install. You save on first cost, fittings, and labor.

On the job, other materials don't compare. CHEMISEAL Nylon Pressure Tubing is unaffected by lubricants, alkalies, acids, solvents. It can be twisted, bent, flexed into any position—will resist abrasion, impact, vibrational fatigue. CHEMISEAL Nylon is serviceable from −60° F. to +180° F. (can be heat stabilized for 300° F.); available for 1000 and 2500 psi, conforming to J.I.C. specifications. Diameters range from ⅛" O.D. to largest size commercially made, depending on customer needs.

Discover how you can use CHEMISEAL Nylon Pressure Tubing. Contact one of The Garlock Packing Company's 30 sales offices and warehouses throughout the U.S. and Canada, or write for Bulletin NPT.

THE GARLOCK PACKING COMPANY, Palmyra, N. Y.

United States Gasket *Plastics Division of* GARLOCK

Circle **68** *on Time-Saver Card*

BRIEFS

Big Logs Get Big Lift

Eimco Corporation of Salt Lake City has developed a new heavy-duty tractor log loader, featuring rugged construction and a high-loading capacity. It's been field-tested for six months in rough timber country.

Hydraulic cylinders are connected to the operating arms and

levers through self-aligning bearings to eliminate many strains due to racking from a long log while traveling.

Log-loading forks are equipped with two grips, interconnected by an equalizer beam. This beam is actuated by a hydraulic cylinder. Regardless of diameter or irregular shape of the circumference, the forks give a better and safer grip on logs.

Maximum lifting height is 14½ feet. □□□

Hydraulic Attachments For Converting Turret Lathes

Conversion of vertical turret lathes for contour turning within extremely close tolerances can now be accomplished with electronic-hydraulic Duplimatic tracer control attachments produced by Tracer Control Co. of Hazel Park, Mich.

Hemispherical or irregularly-

Continued on page 50

HOEN

HYDRAULIC EQUIPMENT FOR INDUSTRY

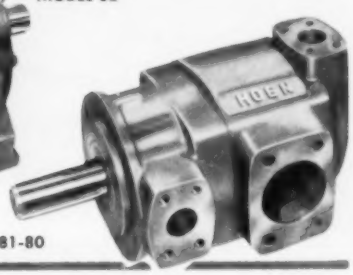
Quality, Performance and Dependability

HOEN High Performance products are designed and manufactured in one of the West's newest industrial plants by a company with an 18 year history of success in development and production of quality hydraulic components.

PUMPS

Single and double pumps of vane type design are offered in capacities from 2.5 gpm to 160 gpm at 1000 rpm. These balanced pumps with suction on each side of pumping assembly can operate at speeds to 2000 rpm range. Hoen pumps deliver longer life due to balanced design, controlled metallurgy, self lubricating, and high volumetric and mechanical efficiency.

MODEL 82



MODEL 81-80

MOTORS

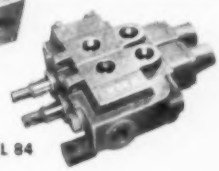
MODEL 86-4800

Vane type motors are available in 2400 inch pound torque and 4800 inch pound torque at 1000 psi with capacities up to 50 and 100 horsepower respectively. They feature self-lubrication and positive vane loading for positive operation and braking. The pressure manifold contains a built-in shock valve for protection.

VALVES

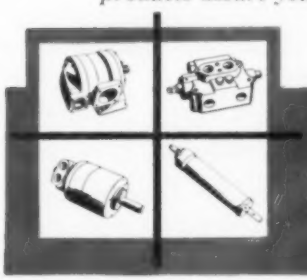
Hoen manufactures single and multiple spool valves in integral and sectional types with large flow capacities up to 200 gpm at low back pressures. Standard features are balanced spools for easy operation, metering type, check and vacuum valves, built-in relief valve, piped, flanged and manifold adaptation.

MODEL 94



MODEL 84

Engineered for greater efficiency and prolonged life, HOEN High Performance products assure you consistent quality of manufacture and greatest reliability and performance in use.



Your inquiry will receive prompt attention.
New color brochure describing all products on request.

HOEN HYDRAULIC CORPORATION

630 West 17th South • Salt Lake City 4, Utah

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specify PAGE Mechanical Packings and get the right answer

If you find yourself with a packing problem, why not call in one of Page's packing experts and let him help you.

Whether the job calls for packings of Oak, Chrome or Retan, treated with any one of many impregnations, coatings or special finishes . . . or whether synthetics will work better . . . you know you can count on Page for quality and service.

Page offers you a complete line of U's, V's, Flanges, Cups, and O-rings, backed up by nearly a century of experience and complete facilities for production of one or thousands.

- for temperatures to 225° F.
- long life
- low cost
- fast delivery
- engineering assistance

Call or write us about your packing problems, for a quote, or for your copy of the Page Packing Manual.

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PAGE BELTING COMPANY
established 1868

Concord — New Hampshire

Page Packings — engineered to do a better job

Circle **122** *on Time-Saver Card*

BRIEFS

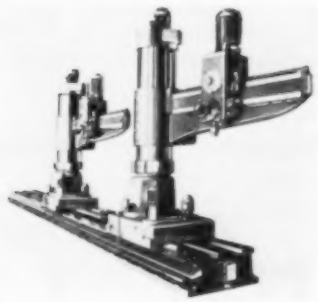
shaped surfaces can be contoured both inside and out. Servo valves are mounted directly to piston motors, providing a tight position loop.

Tolerances of ±.005 at 25 ipm and ±.0005 to 5 ipm are permitted from hydraulic motor shaft. The vertical turret lathe, to which

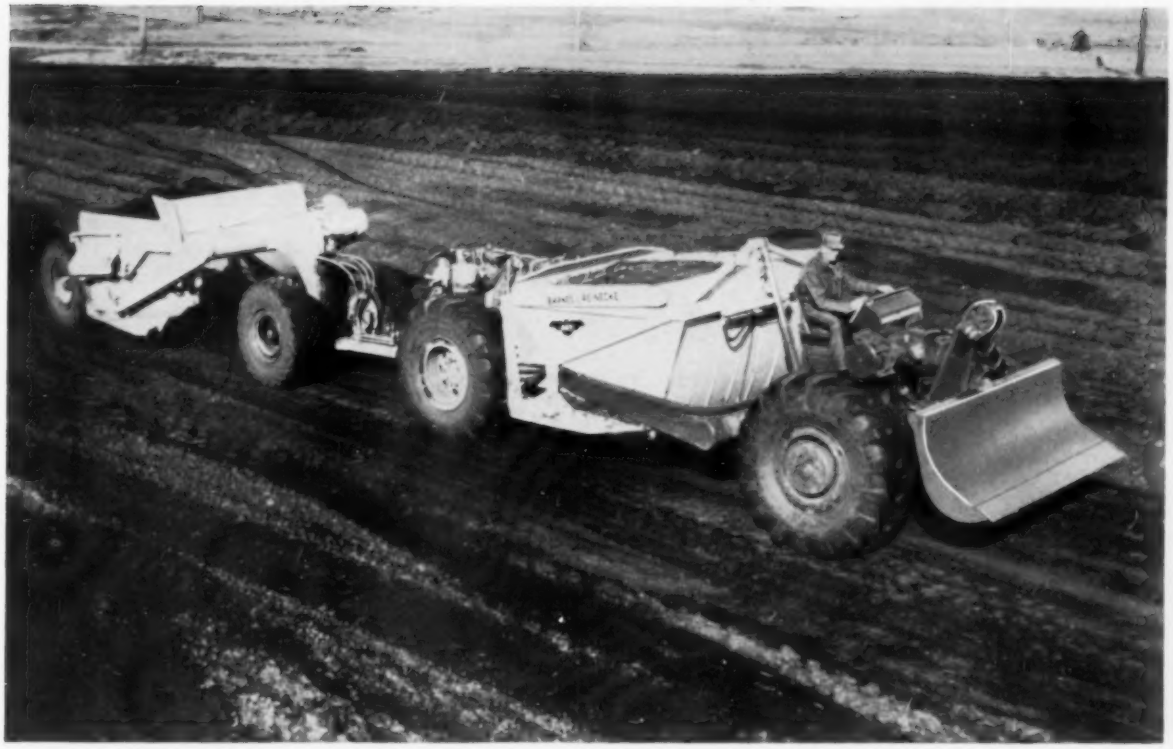
the Duplimatic is attached, must be capable of maintaining these tolerances.

Tracer unit does not interfere with conventional operation of machine tool. Hydraulic motor drive units disengage by means of magnetic clutches with start and stop button.

Each electronic component can be readily removed for servicing due to modular construction. □□□



ELECTRO-HYDRAULIC clamping circuit on this traveling radial drill is self-contained. Hydraulic controls and drill control are panel mounted on the spindle head. Made by Hermes Machine Tool Co., Inc., Long Island City, N. Y.



DYNEX high pressure circuit powers the BAT

The B.A.T. incorporates a 6000 psi Dynex hydraulic circuit for actuation of the dozer, steering and scraper control. The pumps are adaptable for split flow to provide independent actuation of a number of functions simultaneously. The Dynex high pressure circuit was selected to provide high efficiency, low total circuit weight and long life under rugged operating conditions. This machine, developed for the Corps of Engineers by Barnes & Reinecke, Inc., is the first of a series of high performance, light weight machines planned for the Corps. Ultimately, the army of the future will be highly mobile and capable of having equipment dropped at advance bases. Dynex hydraulics are being designed into these machines to incorporate all the advance features they provide.

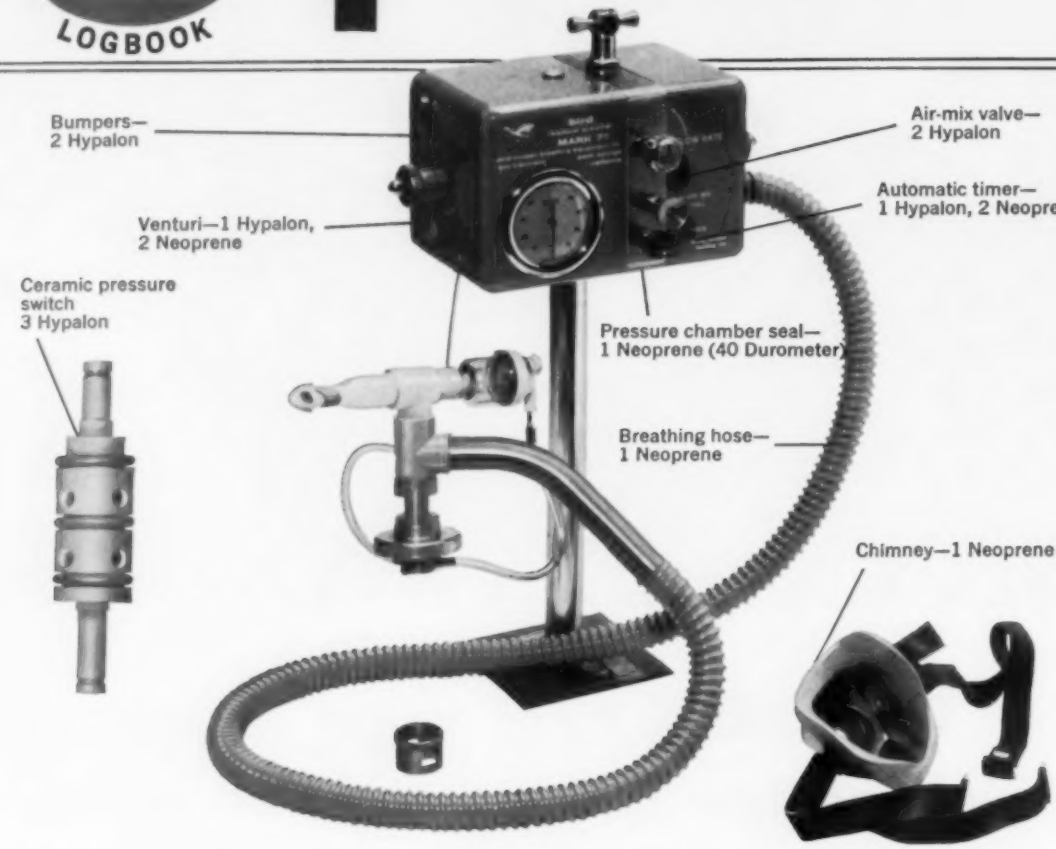
The superior characteristics of Dynex piston pumps and slide valves for working pressures up to 6000 psi have been demonstrated on this equipment. If you are interested in considering higher pressures for your application, consult the Dynex representative in your area.

DYNEX INC., DEPT C-592, 777 DYNEX DRIVE, PEWAUKEE, WISC.

HYDRAULIC PUMPS · VALVES · MOTORS · CYLINDERS · POWER UNITS · CIRCUITS

NATIONAL® OIL SEAL LOGBOOK

For a precision respirator



Uses National Hypalon O-Rings for dependability in home and hospital

20 million cycles of perfect operation. Years of shelf life. Sporadic operation—long idleness, prolonged periods of operation. Extreme sensitivity, precision mechanism. Regular exposure to oxygen, ozone, medication. Reliability that can literally mean life or death.

These are some of the requirements National® O-Rings meet in the revolutionary new Bird MARK 7® Respirator. Introduced little over a year ago, the compact, light-weight Bird MARK 7 is in use throughout the Free World and is hailed by anesthesiologists, surgeons and hospitals as a major advance in therapy for serious disorders such as polio, pneumonia, other lung disorders and coronary problems affecting breathing.

National Welding Equipment Company, makers of the Bird respirator, state that the high order of dependability could not have been achieved without National Hypalon O-Rings. In addition to their stability vs. oxygen, moisture, medications and gases, the Hypalon rings are rugged, and are not damaged when press-installed over extreme-hardness ceramic bushings.

A total of 15 National O-Rings are used in the Bird MARK 7. Nine are Hypalon, five are conventional 70 Durometer neoprene rings and the 15th is a large 40 Durometer Neoprene ring used as a static seal between the pressure chamber and main chassis.

National O-Rings are available in standard sizes, commercial grade, or in special compoundings including Hypalon. For details or O-Ring engineer assistance, call the nearest National Seal engineer. Look in the Yellow Pages, under Oil Seals or O-Rings.

5162

NATIONAL SEAL
Division, Federal-Mogul-Bower Bearings, Inc.
General Offices: Redwood City, California
Plants: Redwood City and Downey, California
Van Wert, Ohio

Circle **117** on Time-Saver Card

Steel

For many years the precise control associated with 'VSG' variable delivery hydraulic pumps and transmission gears has proved invaluable to the Steel Industry.

Mill and drawbench drives, sawing and measuring tables, processing machines and manipulators are a few examples of the many applications of 'VSG' equipment.

The Steel Industry is but one of many industries which 'VSG' has now been serving for over fifty years.

'VSG'
Reg'd Trade Mark

SERVING MODERN INDUSTRY

VICKERS-ARMSTRONGS (ENGINEERS) LIMITED · VICKERS HOUSE · BROADWAY · LONDON SW1
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How B&W JOB-MATCHED TUBING simplifies fabrication of hydraulic cylinders

...The complete range of sizes and types of finish plus close tolerances help to simplify fabricating operations.

...Quality control from start to finish in the tube making operations helps to speed up fabrication and to make a better product.

...Controlled heat treatment provides desired properties for ease of fabrication.

These are just a few of the reasons it pays to specify B&W Job-Matched Mechanical Tubing.

Call the tubing specialist at your local B&W District Sales Office, or write for Bulletin TB-352 for full information. The Babcock & Wilcox Company, Tubular Products Division, Beaver Falls, Pennsylvania.

B&W

THE BABCOCK & WILCOX COMPANY

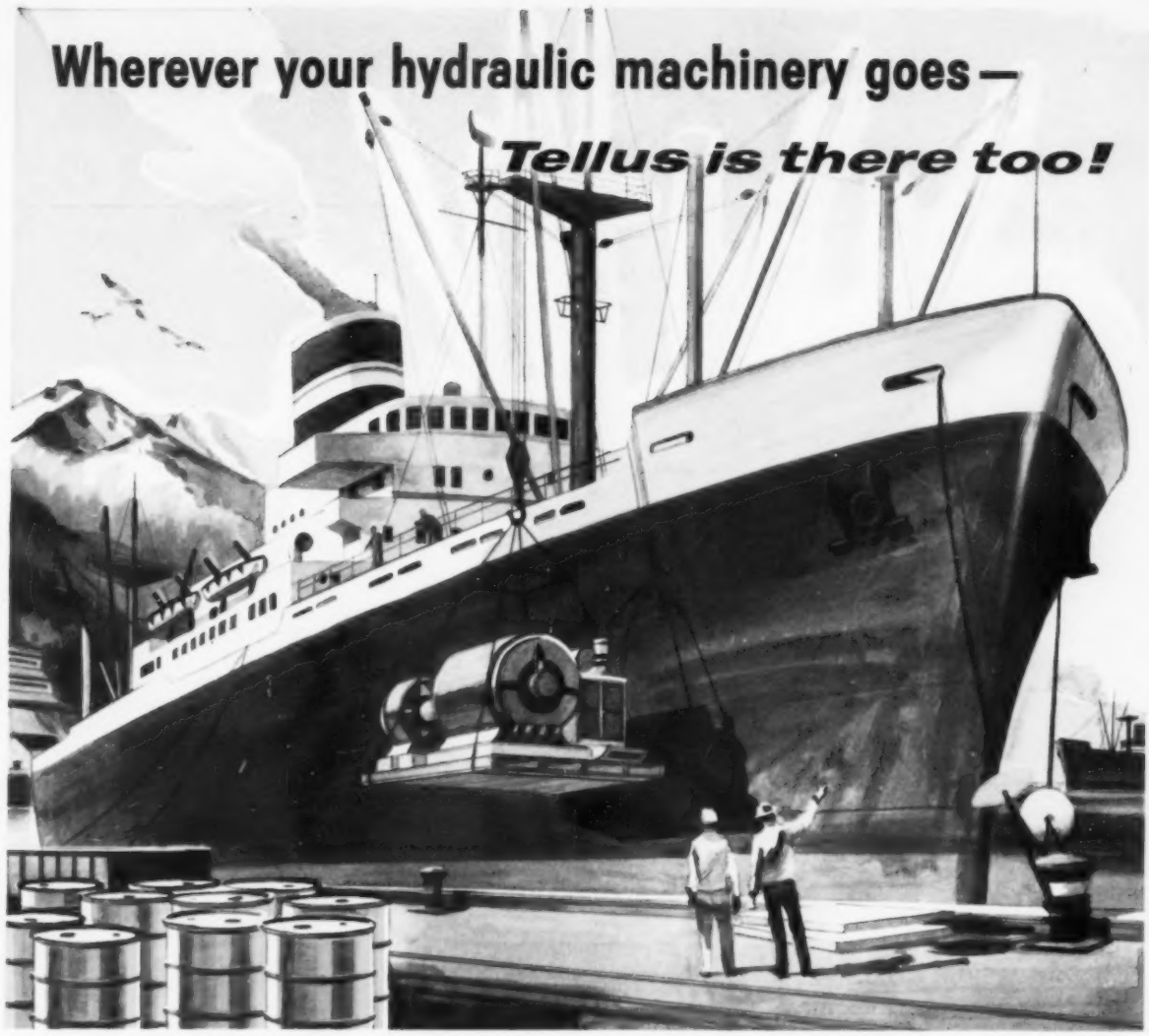
TUBULAR PRODUCTS DIVISION

TA-9008-SM3

Seamless and welded tubular products, solid extrusions, seamless welding fittings and forged steel flanges—in carbon, alloy and stainless steels and special metals

Wherever your hydraulic machinery goes—

Tellus is there too!



Other Outstanding Shell Industrial Lubricants

Shell Rimula Oils—for heavy-duty diesel engines

Shell Talona R Oil 40—anti-wear crankcase oil for diesel locomotives

Shell Alvania Grease—multi-purpose industrial grease

Shell Turbo Oils—for utility, industrial and marine turbines

Shell Dromus Oils—soluble cutting oils for high-production metal working

Shell Macoma Oils—for extreme pressure industrial gear lubrication

Shell Voluta Oils—for high-speed quenching with maximum stability

Its performance and name are the same around the world

Shell Tellus Oil is available to your customers abroad. Because of this world-wide availability, they can enjoy the same performance that your domestic customers rely upon.

Tellus® Oil is top-rated as both a lubricant and a control fluid for complex hydraulic systems. Its ability to combat oxidation, rust, sludge formation, wear and foaming has earned it world-wide popularity.

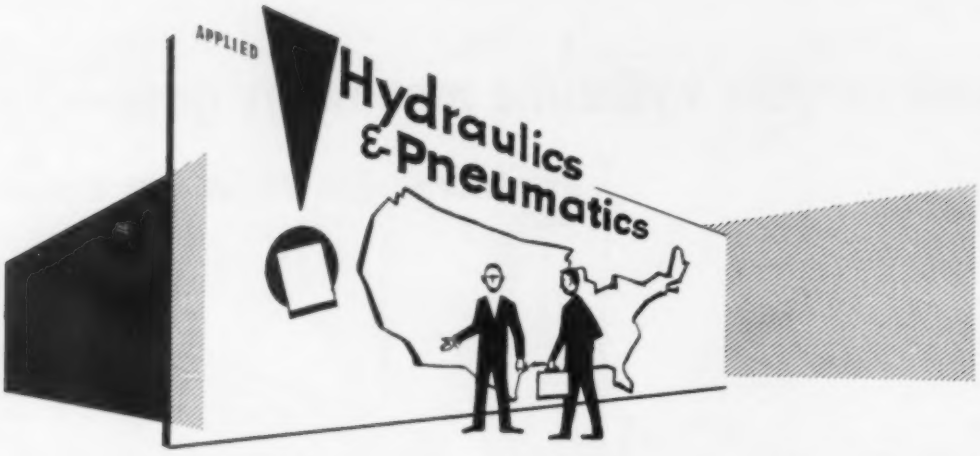
Wherever your hydraulic machinery goes, make Tellus Oil your standard recommendation.

For more complete information, write Shell Oil Company, 50 West 50th Street, New York 20, New York, or 100 Bush Street, San Francisco 6, California. In Canada: Shell Oil Company of Canada, Limited, 505 University Avenue, Toronto 2, Ontario.

SHELL TELLUS OIL

the performance-proven hydraulic oil

SHELL



...Along the aisles

DESIGN ENGINEERING SHOW MAY 25-28 PHILADELPHIA

Philadelphia's Convention Hall plays host to two design engineering events on May 25-28. Attractions are the Design Engineering Show and the fourth annual Design Engineering Conference.

The conference, sponsored by the Machine Design Division of the American Society of Mechanical Engineers, features sessions on the choice of design material, mechanical aspects of design, and power and control in design.

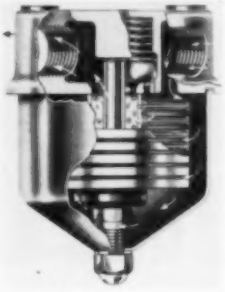
Listed here are fluid power manufacturers and some of the components which will be featured at the Design Show.

Booth	
1030	Acro Division, Robertshaw-Fulton Controls Co.
1056	Acushnet Process Co.
1132	Aeroquip Corporation
1134	Aeroquip Corporation
1136	Aeroquip Corporation
1624	Air-Maze Corporation
717	Alemite Division, Stewart-Warner Corp.
1653	American Sealants Co.
1201	The Auburn Mfg. Co.
1652	Automatic Switch Co.
1654	Automatic Switch Co.
1621	Barco Mfg. Co.
1622	Beemer Engineering Co.
1304	Celanese Corp. of America
401	Chicago-Allis Mfg. Corp.
1055	Commercial Filters Corp.
1412	The Commercial Shearing & Stamping Co.
1400	The Cuno Engineering Corp.
131	E. I. du Pont de Nemours & Co., Inc.
228	E. I. du Pont de Nemours & Co., Inc.
232	E. I. du Pont de Nemours & Co., Inc.
1243	Eastman Mfg. Co.
1513	Eaton Mfg. Co.
1515	Eaton Mfg. Co.
1517	Eaton Mfg. Co.
1521	Eaton Mfg. Co.
1523	Eaton Mfg. Co.
309	Elastic Stop Nut Corp. of America
311	Elastic Stop Nut Corp. of America
1155	Flexonics Corporation
82	Flodar Corporation
1413	The Garlock Packing Co.
1449	General Controls Co.
613	Hansen Mfg. Co.
1138	The Hilliard Corporation
1125	Hoke Incorporated
607	E. F. Houghton & Co.
1424	Humphrey Products Division, General Gas Light Co.
1053	The Hydreco Division, The New York Air Brake Co.
1245	Hydromatics, Inc.
1538	The Imperial Brass Mfg. Co.
1328	International Packings Corp.
1554	Micro Switch Division, Minneapolis-Honeywell Regulator Co.
1239	C. A. Norgren Co.
1456	Parker-Hannifin Corp.
1458	Parker-Hannifin Corp.
315	The Polymer Corp. of Pennsylvania
1553	Raybestos-Manhattan, Inc.
1555	Raybestos-Manhattan, Inc.
305	M. H. Rhodes, Inc.
402	Roper Hydraulics, Inc.
1429	A. Schrader's Son Division
1613	Sealol Corp.
1359	Skinner Electric Valve Division, The Skinner Chuck Co.
1139	Stratoflex, Inc.
1433	Superior Tube Co.
414	Titeflex, Inc.
1537	U. S. Electrical Motors, Inc.
1539	U. S. Electrical Motors, Inc.
1130	Valcor Engineering Corp.
1428	Vickers Incorporated
1432	Vickers Incorporated
1301	The Weatherhead Co.
1358	The S. S. White Dental Mfg. Co.

Booth

1624 Air-Maze Corp.

You'll see . . . a liquid filter, available for large or small capacities, low or high pressure with or without built-in



relief valve. Solves problems of high pressure, limited space, high temperatures, and corrosive fluids.

Circle **200** *on Time-Saver Card*

717 Alemite Division of Stewart-Warner Corp.

You'll see . . . reusable hose couplings, which can be retightened on the hose without disassembly. For either single or double wire braid hose. Does not require special tools for assembly.

Circle **201** *on Time-Saver Card*

1653 American Sealants Co.

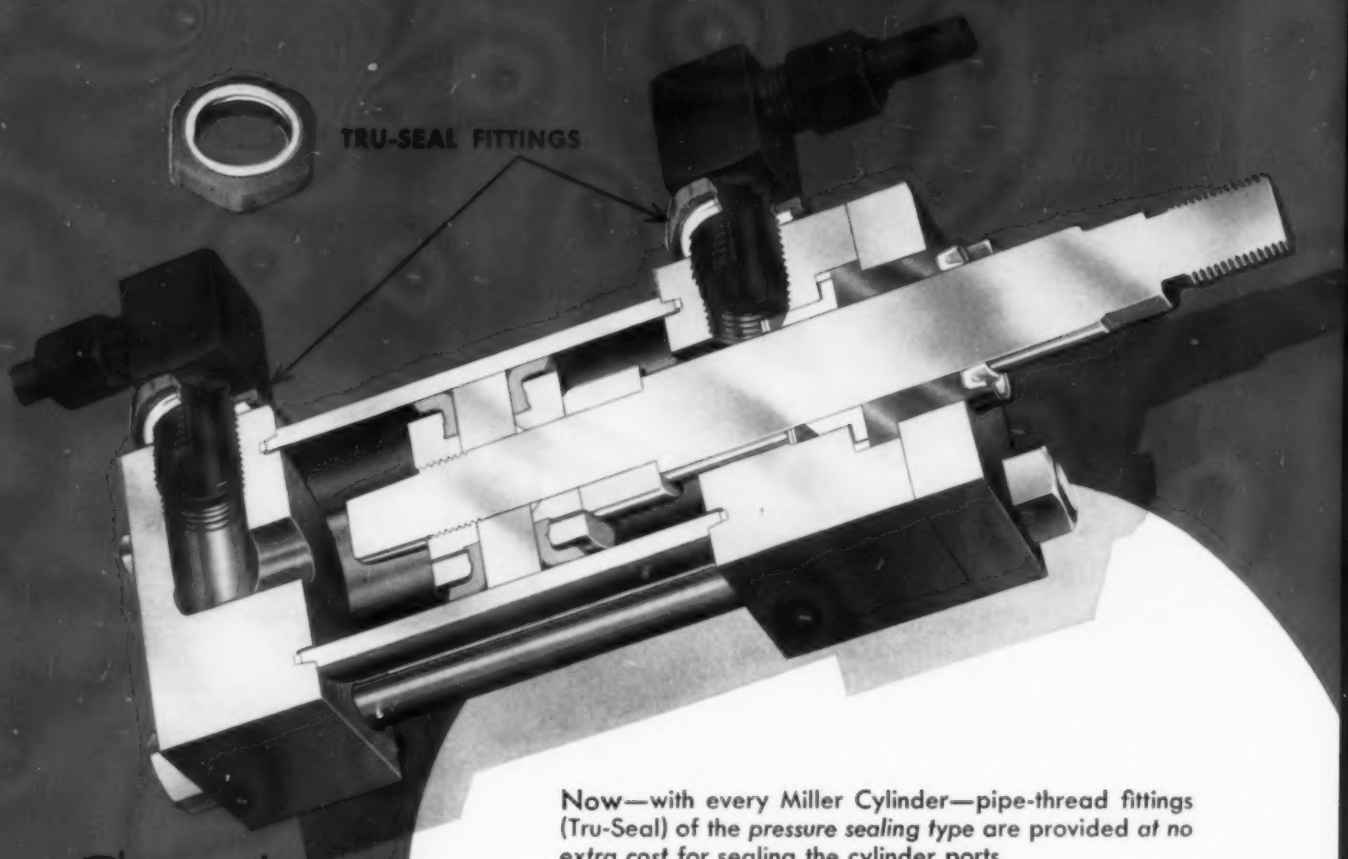
You'll see . . . a new design engineer's kit, #10-10, containing ten grades of Loctite sealant. Assists designer in determining proper grade of sealant during product development stages and for general experiment work. Each bottle contains enough sealant for many tests.

Circle **202** *on Time-Saver Card*

Continued on page 58

NOW... even the PORTS have seals of the PRESSURE SEALING TYPE!

(J.I.C. Standard H6.2.2)

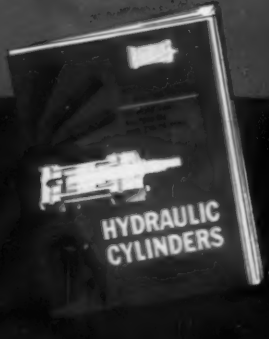


Now—with every Miller Cylinder—pipe-thread fittings (Tru-Seal) of the *pressure sealing type* are provided *at no extra cost* for sealing the cylinder ports.

Additional advantages of these fittings are:

1. All circuit piping and fittings can be easily positioned.
2. Damage to equipment caused by high tightening torque is completely eliminated (especially on valves, pumps, etc.)
3. Sealing material is Teflon, which is compatible with all hydraulic fluids (J. I. C. Standard H6.2.1)

Specify Miller For Greater Reliability



Engineering Bulletins on Miller Air and Hydraulic Cylinders Available on Request

MILLER FLUID POWER

DIVISION OF FLICK-REEDY CORPORATION

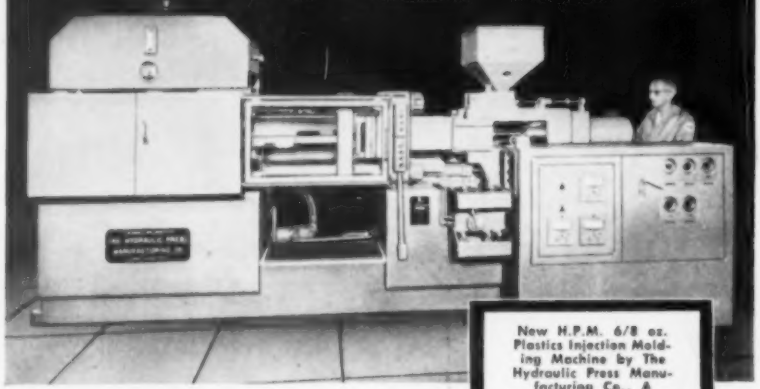
7N017 YORK ROAD, BENSENVILLE, ILLINOIS

AIR AND HYDRAULIC CYLINDERS • ACCUMULATORS
COUNTERBALANCE CYLINDERS • BOOSTERS

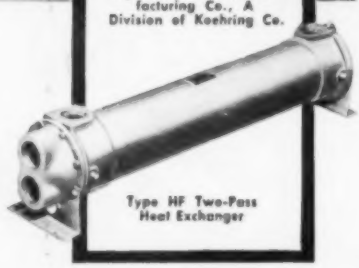
Young

HIGH PRESSURE HEAT EXCHANGER

Solves Cooling Problems on High Speed Injection Molding Machine!



New H.P.M. 6/8 oz. Plastics Injection Molding Machine by The Hydraulic Press Manufacturing Co., A Division of Koehring Co.



Type HF Two-Pass Heat Exchanger

Young Model HF

Heat Exchanger cools Hydraulic Fluid under high pressures

Built for the packaging and like industries, this new high-speed plastics injection molding machine has a tremendous capacity. Full clamp stroke at 720 cycles per hour, and as many as 900 cycles per hour with reduced stroke. Continuous operation at such high speeds is made possible by the use of a Young Type HF (High Pressure) heat exchanger which keeps the hydraulic fluid at the correct temperature for most efficient operation. One of over 400 standard models, a Young Type HF Heat Exchanger is used here for working pressures of 150 psi on the tube side and 250 psi on the shell side, at maximum temperature ratings of 350F. Besides having over 400 "stock answers" to heat transfer problems. Young designs and builds special heat exchangers to meet any requirements.

Write Dept. 449-E for Catalog No. 1258

Young RADIATOR COMPANY

RACINE, WISCONSIN

Creative HEAT TRANSFER ENGINEERS

Executive Office: Racine, Wisconsin, Plants at Racine, Wisconsin, Matteon, Illinois

Circle **180** *on Time-Saver Card*

...Along the aisles

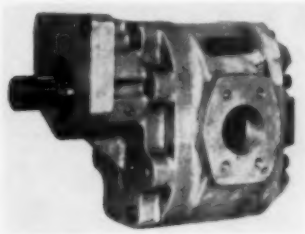
1621 Barco Mfg. Co.

You'll see . . . a compact, improved type of rotary joint, suitable for use with air, oil, or water. This Type C joint is for hydraulic pressures to 100 psi, produced in eight standard sizes, and for either single flow or two-way syphon flow installation.

Circle **203** on Time-Saver Card

1412 Commercial Shearing & Stamping Co.

You'll see . . . three models of fluid power gear pumps with delivery range



from 3 to 95 gpm for continuous duty operation, any pressures to 2000 psi. Also shown will be directional control valves.

Circle **204** on Time-Saver Card

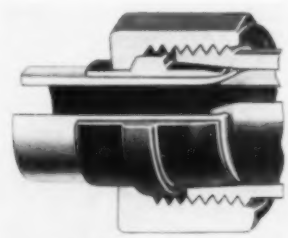
1400 The Cuno Engineering Corp.

You'll see . . . a 1¼" filter cartridge which provides a fine degree of filtration plus a high flow capacity for a wide range of standard housings. Measuring only 4 inches face to face, the cartridge handles in excess of 7½ gpm of 50-SSU fluid at 2-psi drop.

Circle **205** on Time-Saver Card

82 Flodar Corp.

You'll see . . . a new self-flaring tube fitting that employes a hardened steel



sleeve to press the tube into the contoured body to form a flare as the fitting is tightened. This fitting forms a pressure-tight seal on both diameters of the tube.

Circle **206** on Time-Saver Card

Continued on page 60

SIMPLIFY MACHINE DESIGN WITH THIS *Complete* AIR CYLINDER

Save design time — save production costs. Eliminate cams, levers, gearing, linkages or other mechanical means for performing push, pull or lift motions. Design with air in mind.

The Bellows Air Motor is a complete electrically-controlled air cylinder power unit with directional valve and speed controls built in. It requires only one air connection which can be made with flexible hose. Compact, space saving, it fits well into crowded quarters or on moving machine elements. It is fast, responds to a starting impulse instantly. It is easily interlocked and synchronized with related machine movements. Its quality and reliability has been proven in more than quarter of a million installations.

The range of work it can do is limited only by the imagination of the design engineer.

Send for this free booklet

Here in these quick reading pages is the full story of The Bellows Air Motor — what it is doing for others, what it can do for you. Address Dept. AH-559 The Bellows Co., Akron 9, Ohio. Ask for Bulletin BM-25. In Canada, write Bellows Pneumatic Devices of Canada, Ltd., Toronto, Ontario.

The Bellows Co.

DIVISION OF INTERNATIONAL BASIC ECONOMY CORPORATION (IBEC)

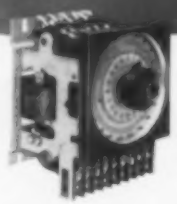
AKRON 9, OHIO

765B-2

OTHER INDUSTRIAL DIVISIONS OF IBEC: Sinclair-Collins Valve Co., Valvair, Akron, Ohio • V. D. Anderson Co., Cleveland, Ohio

Count Control
COMPONENTS
FOR AUTOMATING INDUSTRIAL PROCESSES

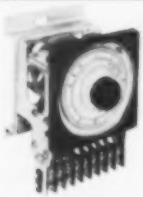
featuring adjustable count · automatic reset · 10 ampere switches



model HZ4
MICROFLEX RESET COUNTER

Use to control an operation for a preset number of counts. Has spring reset to "0." Dial ranges 19, 400 and 1,000 counts.

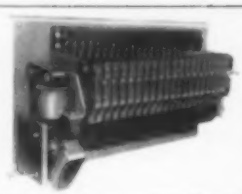
Ask for bulletin 720.



model HZ200
ADD-SUBTRACT COUNTER

Add-Subtract counter — operates from ADD pulses which trip switch at maximum limit — and SUBTRACT pulses which trip switch at "0" limit.

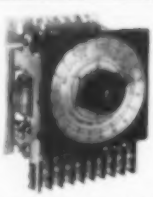
Ask for bulletin 740.



model MT
STEP SWITCH

Use for sequence control from pulses — 19 contacts — 60 cycle coil-break out cam lugs.

Ask for bulletin 780.



model HZ6
MICROFLEX REVOLUTION COUNTER

Use to control an operation as a function of mechanical movement — drive shaft can be mechanically connected to machine, spindle, conveyor, etc.

Ask for bulletin 730.

model HM
MULTIFLEX *(Multiple Circuit)* TIMER

Use for sequence control of 1 to 7 circuits. With shaft drive for mechanical connection to an external drive mechanism.

Ask for bulletin 130.

Write us regarding your count problem. Services of Sales Engineers in 25 district offices are available without obligation. Address Dept. AH-559.

EAGLE SIGNAL CORPORATION
• MOLINE, ILLINOIS
Eagle Timers Save Time — Save Money

Circle **54** *on Time-Saver Card*

...Along the aisles

1456, 1458 Hannifin Company

You'll see . . . a directional, air control valve with new integral speed control section that provides accurate control of cylinder piston speeds. It meters

exhaust flow independently from both ends of the cylinder through a single exhaust port on the valve. Also shown will be a standard lubricator, equipped with a remote fill device that allows easy servicing of air line lubricators.

Circle **207** on Time-Saver Card

1125 Hoke Incorporated

You'll see . . . a complete line of valves, including those for 10,000 psi, and the solenoid valves. Many models include forged steel valves, bar stock needle valves with plastic stem tips, and many small packless valves.

Circle **208** on Time-Saver Card

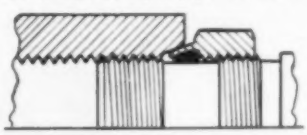
607 E. F. Houghton and Co.

You'll see . . . exhibits showing uses for O-rings to preload cup packings, a magnetically mounted follower plate for hydraulic packing installations, and the double-bladed rod wiping units. Also on display will be the complete line of leather and synthetic rubber packings, plus custom molded parts.

Circle **209** on Time-Saver Card

1538 The Imperial Brass Mfg. Co.

You'll see . . . Dura-Tite, a new development in port sealing on tube couplings which is designed to overcome objections to current taper pipe thread and



O-ring seals. Used with standard SAE straight thread port. Features include ability to withstand 300 F temperature with nylon ring; 450 F with Teflon ring.

Circle **210** on Time-Saver Card

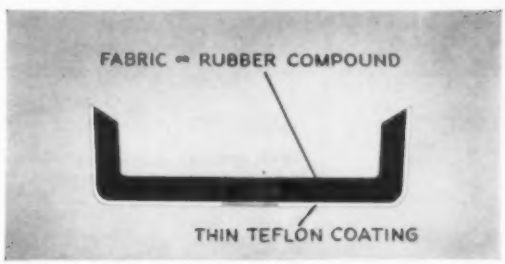
Continued on page 62

Circle **67** ➡

NEWEST OF THE GARLOCK 2,000

First Advance in Cup Design in 30 Years

New Garlock TEFLON-Coated Cups



Cutaway shows how TEFLON coating is applied to outer surface of molded cup by special Garlock process. Coating becomes integral part of outer surface.

This exclusive Garlock development will substantially improve the operation of your hydraulic or pneumatic equipment.

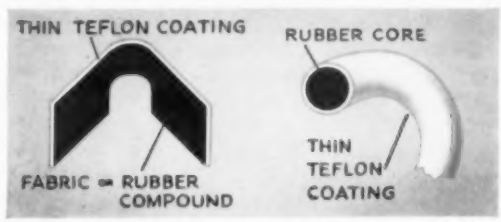
TEFLON-coated cups reduce the breakaway torque required to operate cylinders; reduce running friction; will not stick to cylinder walls even after long periods of idleness. Completely eliminate "squealing." All this, of course, results in longer life, less downtime.

TEFLON, with its low coefficient of friction and anti-sticking characteristics, has for many years resisted the efforts of manufacturers to use it as a coating. The very anti-sticking qualities that make it desirable, also made it difficult to work with. Now Garlock has perfected a technique for coating molded cups with a thin layer of TEFLON. This coating becomes an integral part of the cup.

Most important, of course, TEFLON-coated cups are low in cost, only slightly higher than ordinary cups.

Get full information on this newest member of "the Garlock 2,000" . . . two thousand styles of packings, gaskets, and seals for every need. Call your local Garlock representative or write for Folder 145. You'll find information on other Garlock products in Sweet's Product Design File.

Other New Garlock TEFLON-Coated Products



To reduce friction and reduce downtime at low cost on applications using V-type packings or O-rings Garlock also furnishes TEFLON-coated CHEVRON* packing and TEFLON-coated O-rings. Both have the same exceptional anti-friction qualities of TEFLON-coated cups. These products are available in all the standard sizes. Write for CHEVRON folder AD-115; or O-Ring Folder AD-148.

*Registered Trademark

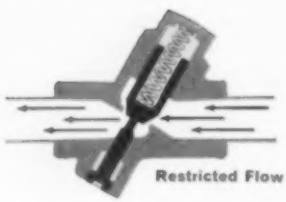
THE GARLOCK PACKING COMPANY, Palmyra, N. Y.

For Prompt Service, contact one of our 30 sales offices and warehouses throughout the U. S. and Canada

GARLOCK

Packings, Gaskets, Oil Seals, Mechanical Seals, Molded and Extruded Rubber, Plastic Products

New Westinghouse FLOREG Valves for accurate flow control of gases and liquids


Restricted Flow

Free Flow

The new Westinghouse Floreg Valve accurately controls the rate at which a gas or liquid can flow in one direction through the circuit, yet allows free flow in the opposite direction. It works with other components of a fluid circuit to time, to sequence or to co-ordinate the operations of the circuit.

Chief Advantages

Easily adjustable in minute steps to full flow.

Greater capacity, lightweight and compact.

Consistent flow regulation: Single flow passage eliminates leakage encountered in separate check valve design.

Corrosion resistant: Made of aluminum, stainless steel and plated steel parts. Seals are oil-resistant.

Working pressure: 250 psi maximum pneumatic, 500 or 2000 psi maximum hydraulic.

Easily inspected and maintained: No need to break circuit connection.

Operating temperature range: —40 ° to 200° F.

Three sizes: ¼", ⅜", and ½", N.P.T.

Prices start at $4.00 on the ¼" size weighing 2.5 ounces.

Applications

. . . In the delivery line to a cylinder to control its piston speed.

. . . In material processing to time operations.

. . . In material handling to co-ordinate movement.

. . . In the speed line of a diesel engine to control acceleration rate.

See the yellow pages under cylinders for the name of your local distributor

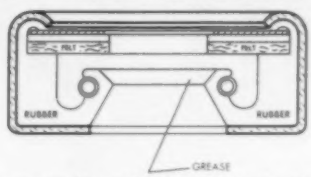
WESTINGHOUSE AIR BRAKE COMPANY
Industrial Products Division, Wilmerding, Pennsylvania

Circle **177** on Time-Saver Card

. . . Along the aisles

1328 International Packings Corp.

You'll see . . . the custom-designed filter-type lip seal which combines a synthetic compound, a built-in felt and rubber filter, and case. This seal has a



provision for preloading lubricant. Also to be shown will be oil seals, packings, and O-rings which use fluorinated rubber to meet high temperatures.

Circle **211** on Time-Saver Card

1504 Lovejoy Flexible Coupling Co.

You'll see . . . a complete line of power transmission equipment, including flexible couplings, variable speed pulleys, belts and sheaves, motor bases, variable speed transmissions, shaft-mounted gear reducers, and universal joints.

Circle **212** on Time-Saver Card

315 The Polymer Corp.

You'll see . . . Nylaflow pressure tubing for continuous use in an oxidizing atmosphere to 225 F. This grade may be exposed intermittently to temperatures as high as 300 F, and is designed for use where elevated temperatures and exposures to water limit application of standard tubing.

Circle **213** on Time-Saver Card

1553, 1555 Raybestos-Manhattan, Inc.

You'll see . . . a complete line of mechanical packings and gasket materials, featuring a new compressed asbestos sheet. Made in thicknesses of .008 and .001 inches, it withstands high temperatures.

Circle **214** on Time-Saver Card

305 M. H. Rhodes, Inc.

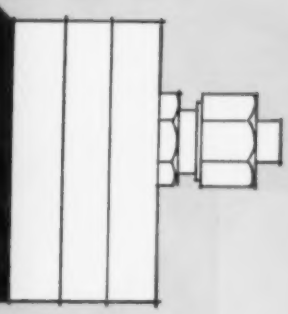
You'll see . . . a streamlined portable time switch which turns off equipment after a preset time period of from 5 minutes to 12 hours. Also on display will be a time switch which has a range from 1 minute to 12 hours.

Circle **215** on Time-Saver Card

Continued on page 64

Circle **55** ➡

off-the-shelf pumps just right for your requirements



Whatever you want in a pump – for hydraulics, for flow or process control, there is likely to be an Eastern ready-made unit . . . made-to-order for your needs.

CAN YOU USE THESE PUMP FEATURES:

- ☐ corrosion resistant construction for chemical solutions?
- ☐ ability to handle organic and inorganic fluids at various temperatures with flows up to 70 GPM, pressures to 65 psig?
- ☐ available with open, enclosed or explosion proof motors?
- ☐ compact lightweight units with or without motor?
- ☐ high efficiencies in handling hydraulic oil, fuel and lubricants at high pressures?
- ☐ flow rates from 0.1 to 9.8 GPM, pressures from 0 to 1500 PSI?
- ☐ self-priming operation with non-lubricating liquids?
- ☐ high pressure outputs with small, low power units... and no contamination of fluid?
- ☐ flow rates from ½ GPM to 5½ GPM, pressures from 30 to 200 PSI?

An EASTERN CENTRIFUGAL PUMP MIGHT BE JUST RIGHT FOR YOU!

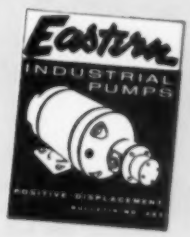
Write for Bulletin 120.

Look into EASTERN HYDRAULIC PUMPS!

Write for Bulletin 810

Get to know more about EASTERN POSITIVE DISPLACEMENT PUMPS!

Write for Bulletin 220.



These useful brochures contain full specifications on the complete line in each category, including performance data and tables. They will be sent to you at no obligation whatever. Write Department Y.

EASTERN INDUSTRIES PUMP DIVISION ®

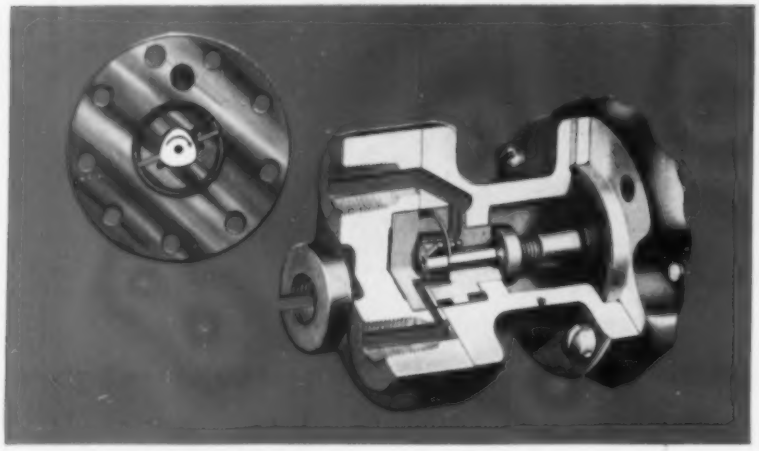
EASTERN INDUSTRIES, INC.

100 SKIFF STREET, HAMDEN 14, CONN.

YESTERDAY'S PIONEER . . . TODAY'S LEADER

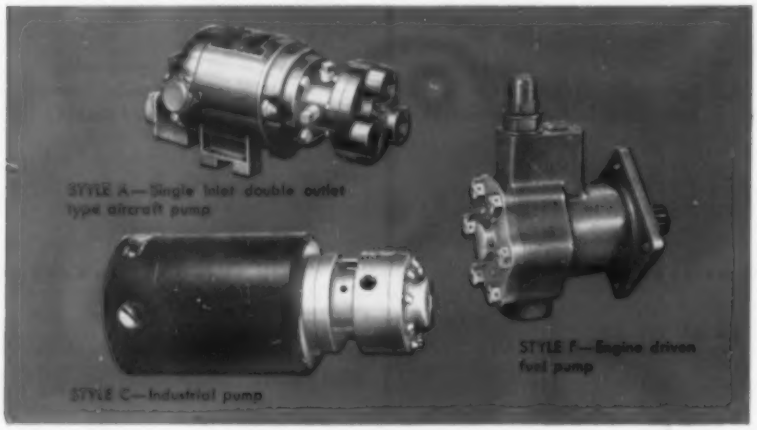
WELDON / FLUID METERING PUMPS

Positive Displacement Rotor Type. For Industrial Applications, Aircraft Anti-Icing and Aircraft Fuel.



IT'S SO SIMPLE!

The rotation of the rotor draws the fluid in through two passages, filling the cavities formed by the three lobes of the rotor. This fluid is sealed within these small cavities until it is forced through the two outlet holes by the floating blades. The flow may be kept uniformly divided through two outlet ports, or may be combined internally for passage through a single port.



COMPACT • LIGHT WEIGHT

Send for Weldon Manual and Catalog with detailed specifications and installation drawings, covering the full range of Weldon pumps in various capacities. Specify your requirements.

40 YEARS OF LEADERSHIP 1918—1958

THE WELDON TOOL COMPANY

3000 WOODHILL ROAD · · · CLEVELAND 4, OHIO

Circle **176** *on Time-Saver Card*

...Along the aisles

1433 Superior Tube Co.

You'll see . . . a complete line of low carbon steel hydraulic tubing meeting all JIC and SAE specifications. Tubing remains soft for ease of hand bending and flaring and is recommended for pressures to 3000 psi.

Circle **216** *on Time-Saver Card*

1301 The Weatherhead Co.

You'll see . . . inserts for hose ends to eliminate wrestling with hard-to-handle lines and skiving of hose. Positive grip assured to withstand working pressures

up to 250 psi and burst pressures to 1000 psi. Also on display will be a hose cutting machine and a hose swaging machine that is positioned at a 45-degree angle for upright operation.

Circle **217** *on Time-Saver Card*

1428, 1432 Vickers, Incorporated

You'll see . . . the new ¾" pressure reducing valve with one-piece body design that incorporates integral relief and hydrostatic flow control elements. Rating is 8 gpm, 3000 psi maximum

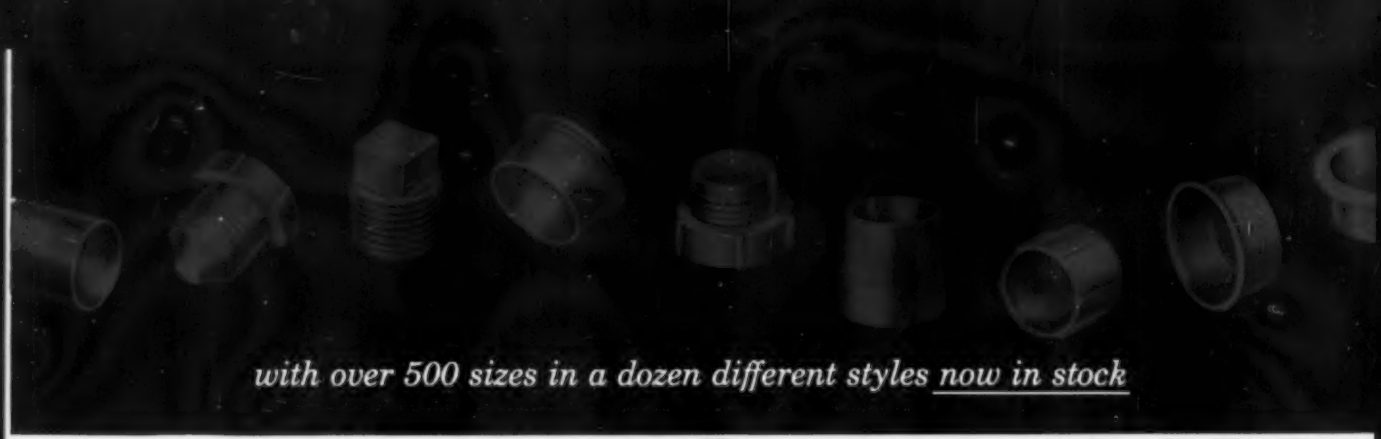
inlet pressure. Features rapid response and minimum pressure override in handling reduced pressure range of 25 to 2500 psi. Also on display will be a complete line of valves, control panels, and pumps.

Circle **218** *on Time-Saver Card*

406 Applied Hydraulics & Pneumatics

Come and see us to discuss your fluid power developments and problems.

Circle **134** ➡



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USEFUL LITERATURE

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CLAMP-TYPE CYLINDER

Series CLH is compact, designed for rugged automation. Hydraulic clamp-type cylinder has 1½" bore, is only 1⅝" square. Pre-stressed tie-rod type construction. Supplied in single or double acting types from stock in 1, 2, 3" strokes. Bulletin 159. Dimensional drawings, construction features, product photos. *The Sheffer Corp., Cincinnati, Ohio.*

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SYNCHRONOUS MOTORS

Described in text and illustrations. Gives design features, construction and applications of constant speed motors. Photos show manufacturing techniques and typical installations. Four pages. No. GEA-6814. *General Electric Co., Schenectady, N. Y.*

Circle **401** on Time-Saver Card

PUMPS AND MOTORS

High temperature hydraulic pumps and motors for speeds to 24,000 rpm. Temperature range between −65 and +550 F. Six models illustrated, with specifications and characteristics for particular uses. Two charts show effect of inlet temperature on pump performance at full flow, full pressure and through cutoff at rated speed. *Pesco Products Division, Borg-Warner Corp., Bedford, Ohio.*

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METAL GASKETS

Consist of spirally wound strips of "V"-shaped, performed stainless or zinc coated carbon steel, alternated with layers of asbestos or Teflon. For use against liquids in high pressure, high temperature applications. Bulletin AD-104 lists compressibility and resistance features. Contains section on flange face finish to gasket efficiency relationship. Specifications on round, oval, square, flat side, diamond and pear-shaped gaskets included. *The Garlock Packing Co., Palmyra, N. Y.*

Circle **403** on Time-Saver Card

AIR VALVES

Complete line of air valves pictured, described in 12-page "Valve Finder" Bulletin 234. Explanation of valve terms and principles used in industry. Three-step outline covering valve types, means of actuation. *Hannifin Co., Des Plaines, Ill.*

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HYDRAULIC EQUIPMENT

Custom-built air and hydraulic equipment, devices, applications described in 4-page Bulletin GL-11. Application photos describe types of installations. *Precision Products, Inc., Cleveland, Ohio.*

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DUCTILE IRON

For hydraulic cylinder assembly component parts. Catalog has 36 pages, illustrated, gives technical data including grades, specifications, dimensions, weights, uses, and applications. *American Cast Iron Pipe Co., Birmingham, Ala.*

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TESTING EQUIPMENT

Carefully engineered to meet specific requirements of given application. Pressure generating equipment consists of oil hydraulic pumping unit operating a piston-type intensifier. Product photos, features in leaflet. *Benjamin Lassman & Son, Glenshaw, Pa.*

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DRYER

Solves need for economical instrument that dries and cleans compressed air. Extracts water and water vapor to prevent corrosion, dilution, pollution, freezing. Eliminates contaminants. Performance graphs, specification tables, dimensional diagrams, model lists in 12-page Catalog D3-1058NE5. *Van Products Co., Erie, Pa.*

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CENTRIFUGAL CASTINGS

Contents include fold-out alloy chart showing comparative specifications, chemical analyses, minimum physical properties of nonferrous alloys. Photos of broad range of component parts, assemblies produced by centrifugal method. Qualities, characteristics, applications, drawings also in foldout. Bulletin 157. *Centrifugally Cast Products Division, Shenango Furnace Co., Dover, Ohio.*

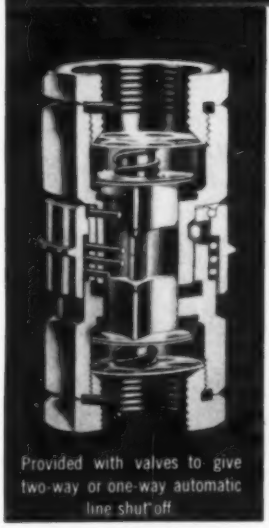
Circle **409** on Time-Saver Card

AIR FILTER

Constructed with die-cast aluminum base and head, held together with single bolt, washer, and gasket. Has capacity of 600 SCFH with initial pressure drop of 1" of water Leaflet has performance chart, specifications. *Dollinger Corp., Rochester, N. Y.*

Circle **410** on Time-Saver Card

For more reviews of FREE LITERATURE turn to page 164



Provided with valves to give two-way or one-way automatic line shut-off

Built to handle high pressure hydraulic and pneumatic systems

Snap-Tite *valved* couplings stop flow instantly"

Snap-Tite provides instant shut-off wherever fluid coupling is needed.

Snap-Tite *valved* couplings connect and disconnect quickly and fully—they automatically open line flow when connected; positively seal your line when disconnected—with no "ifs," no chance for human error.

Snap-Tite couplings are available in sizes from ¼" to 6" ID, in steel, brass, aluminum, 303 ss and 316 ss. Sizes from 6" to 10" ID are available on special order. For more information, write for Snap-Tite catalog #58. Snap-Tite representatives are located in all principal cities.

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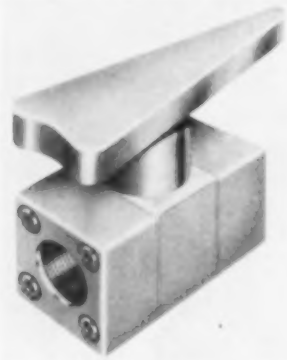
NEW PRODUCTS

Components, tools and equipment for fluid power systems. For more information fill in and mail post card bound in this issue.

PLUG VALVE
. . . for 3000 psi

Designation: Flo-Ball
Features: Zero leakage. One-quarter turn positive opening and shut-off. Replaces needle valve in non-throttling applications. Responds to finger tip pressure and



clicks into place at both ends of quarter turn. Handle position indicates valve position. Takes variety of end fittings. For gauge shut-off and with corrosive or other hard-to-handle fluids.

Hydromatics, Inc.
Livingston, N. J.
Circle **300** *on Time-Saver Card*

PRESSURE SWITCH
. . . is easily adjusted

Features: Designed for hydraulic system, this piston-type differential switch senses pressure difference of 10 to 2000 psi in operating system

of 50 to 5000 psi. Senses drop through an orifice, filter. Piston actuates an electrical snap-action type switch in event of excessive restriction. Compression spring controls differential, and may be adjusted externally for minor changes.
Specifications: Standard units with ¼ male tube, per AND 10056-4, or ¼ male pipe connections, and an AND type electrical connection in stock. Weigh 4 oz., 3½" long. Operating temperature of —65 to 160° F and electrical rating of 15 amps at 120 volts ac.

Fisher Controls Inc.
Santa Monica, Calif.
Circle **301** *on Time-Saver Card*

SERVO VALVE
. . . for industrial systems

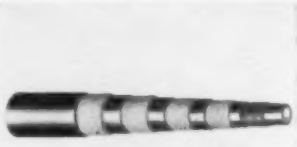
Designation: Series 71
Features: Has 2-stage, force balance feedback principle with large, field-replacable filter integral within rugged cast Meehanite body. May be supplied with either standard connector or terminal box

to accommodate electrical input. For industrial hydraulic control systems, such as control of automatic machine tools, process valve positioning, positioning and transfer devices, grading machines, and automatic power steering of material handling trucks.
Specifications: In 1, 2, 5, and 10 gpm with 1000 psi valve drop and 20 ma input. System pressures from 500 to 4500 psi may be used.

Moog Valve Co. Inc.
East Aurora, N. Y.
Circle **302** *on Time-Saver Card*

HIGH-PRESSURE HOSE
. . . 12,500 psi

Designation: Super-Spiral
Features: Wire reinforcements spirally wound, with absence of wire braid. Spiral wire permits use of heavier wire (.022"), eliminating

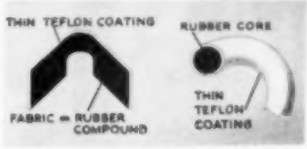


crossed wires of braid. This reduces wire fatigue. Inner tube constructed of oil-resistant neoprene compound, reinforced by open textile braid.
Specifications: In both 4 and 6-ply all-spiral wound wire reinforced styles, and sizes from 3/16" ID to 1½" ID. Top working pressures 10,000 psi for 4-ply, and 12,500 psi for 6-ply in 3/16" ID sizes, and 2500 psi for 4-ply and 3000 psi for 6-ply in 1½" ID size.

Anchor Coupling Co., Inc.
Libertyville, Ill.
Circle **303** *on Time-Saver Card*

COATED CUPS
. . . reduce breakaway torque

Features: Coated with Teflon. Reduce breakaway torque required to operate cylinders, reduce running friction, will not stick to



cylinder walls even after prolonged periods of idleness, and eliminate packing chatter and squealing.

The Garlock Packing Co.
Palmyra, N. Y.
Circle **304** *on Time-Saver Card*
Continued on page 70

Photo courtesy of Pettibone Mulliken Corp., Chicago, Ill.

MARVEL Synclinal FILTERS

are Standard Equipment on

Pettibone "SPEED SWING" 180 Degree Swing Loaders

SUMP TYPE
(Cutaway)

MR. A. T. LOGUS, Chief Engineer of Pettibone Mulliken Corp. expresses preference for Marvel Synclinal Filters as follows—

(A) ***"The ratio of the total filtering net area to the net area of the inlet pipe is much higher than any other oil filter on the market.***

(B) ***The direct result of the high area ratio is lower hydraulic pressure drop over prolonged operating periods.***

(C) ***All materials used in manufacturing the Marvel Filters are impervious to corrosive action from the additives and other elements contained in oil.***

I might add that the price of these filters is lower than some makes of oil filters that are much less desirable on the basis of the above three points."

LINE TYPE
(Cutaway)

OVER 800
Original Equipment Manufacturers

of stationary or mobile equipment utilizing hydraulic or other low pressure liquid circulating systems are installi g Marvel Synclinal Filters as Standard Equipment.

A SIZE FOR EVERY NEED

Available for sump or line installation in capacities from 5 to 100 G.P.M. Greater capacities may be attained by multiple installation (as described in catalogs). Choice of monel mesh sizes range from coarse 30 to fine 200.

EASY TO CLEAN

Both sump and line types are easily disassembled, thoroughly cleaned and reassembled, on the spot, in a matter of minutes. Line type operates in any position and may be serviced without disturbing pipe connections.

IMMEDIATE DELIVERY

Catalogs contain dimensional charts and complete engineering data making it easy to order a filter for your specific requirements and get Immediate Delivery.

MEET J.I.C. STANDARDS

MARVEL ENGINEERING COMPANY
7227 N. HAMLIN AVE.,
CHICAGO 45, ILLINOIS
Phone: JUNIPER 8-6023

Without obligation, please send me complete data on Marvel Filters, as indicated: (AH-5)

- ☐ Catalog #108—For Hydraulic Oils, Coolants, Lubricants
- ☐ Catalog #200—For Fire-resistant Hydraulic Fluids (Aqueous Base)
- ☐ Catalog #400—For Fire-resistant Hydraulic Fluids (Synthetic)
- ☐ Catalog #301—For Water

Name ..... Title .....

Company .....

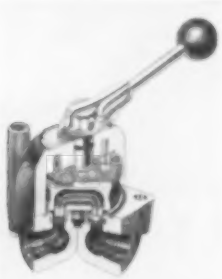
Address .....

City ..... State .....

NEW PRODUCTS

4-WAY MANUAL VALVE
. . . to 3000 psi

Designation: 6140 Series
Features: Constructed of high tensile heat-treated aluminum. Moving parts incorporated internally to reduce maintenance and thus constantly lubricated by hydraulic oil flow. Mounting of

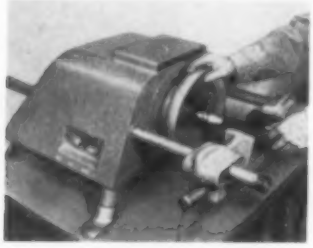


valve simplified by threaded bosses which are integral part of valve housing. Leakproof. Non-sensitive to grit or dirt.
Specifications: For use on oil systems with pressures to 3000 psi. Withstands proof pressure of 4500 psi and instantaneous surges of 9000 psi. Port sizes from ¼ to 1" NPT with rated flow from 7 to 38 gpm.

Barksdale Valves
Los Angeles, Calif.
Circle **305** *on Time-Saver Card*

HOSE ASSEMBLY MACHINE
. . . is portable

Designation: Model 422
Specifications: Has ½ hp, 60-cycle electric motor, furnished for 110

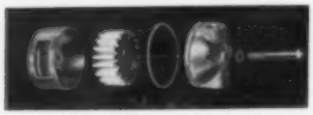


volts. Handles hose from ¼" to 1⅜" inside diameter. Operates on dc or 25-60 cycle single phase ac.

Parker Fittings & Hose Div.
Parker-Hannifin Corp.
Cleveland, Ohio
Circle **306** *on Time-Saver Card*

COMPRESSED AIR FILTER
. . . made of aluminum

Features: Consists of 6 parts assembled by single bolt. Constructed of die cast aluminum with inlet and outlet pipe connections ¾ or



1" standard female. Should be located on compressed air piping as near to point of usage as possible.
Specifications: Is 5¼" high, has 4½" diameter. Capacity is 600 scfh with initial pressure drop of 1" of water. Design pressure is 125 psi.

Dollinger Corp.
Rochester, N. Y.
Circle **307** *on Time-Saver Card*

REDUCING VALVE
. . . for pressures to 300 psi

Designation: Fig. 1910, Type E
Features: Initial pressures to 300 psi with oil, water. Valve, made of cast iron with bronze and steel trim, is of single diaphragm, single

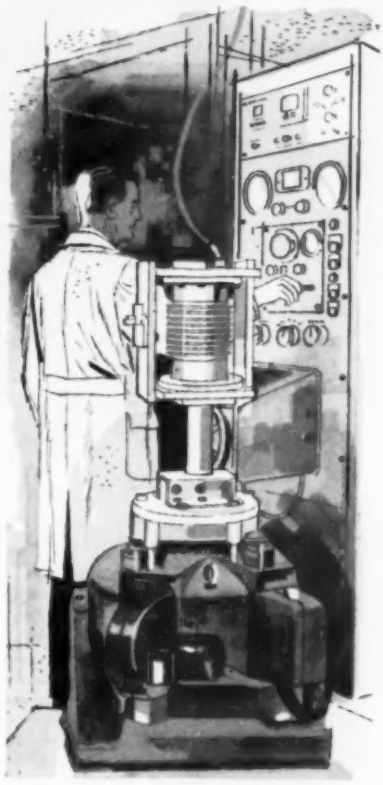
composition seat construction. Simple to service, silent operating, piston-balanced for accurate regulation and single seating for dead end service.
Specifications: Available in six sizes from ½ to 2". Outlet or regulated pressure spring ranges are 5-35, 20-60, 40-90.

Atlas Valve Co.
Newark, N. J.
Circle **308** *on Time-Saver Card*

For more NEW PRODUCT reviews turn to page 145

Flexonics Research Laboratories

Applied Research... Development...Testing



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Our laboratories perform vibration, shock, high and low temperature, sand and dust, altitude and salt spray tests.

Functional testing includes liquid and gaseous flow, high and low pressure, impulse, applied motion and leak detection.

You are invited to write for your copy of Flexonics Capabilities Summary.

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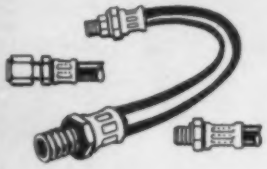
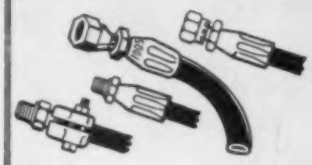
YOUR ONE BEST SOURCE FOR

Everything in Hydraulic Hose



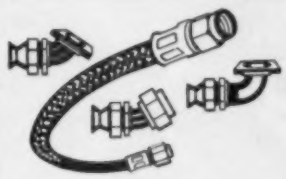
FACTORY PRESSED-ON ASSEMBLIES—Standard hose assemblies or to your specifications.



FIELD-ATTACHABLE FITTINGS—Popular for replacement . . . Easy-Grip hex requires no special tools.

BULK HOSE—Most complete range of types and sizes, for all industrial, automotive, and aircraft requirements.

LOW PRESSURE HOSE—Flexonics offers the most extensive line of low pressure hose available today



TEFLON* HOSE—Flexonics offers a full range of stainless steel braided Teflon for steam and chemical applications.

* DU PONT TRADE MARK

EXPERT ENGINEERING—To assist in the selection and design of hose assemblies for your application.

For hose, hose assemblies, couplings and adapters in all sizes and designs . . . depend on Flexonics. Skilled Flexonics application engineers have more to work with . . . have unparalleled experience in supplying every segment of industry. For large or small requirements—standard or special—consult Flexonics.

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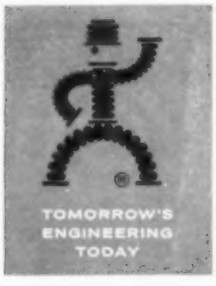

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it gives—
and it takes

the higher the pressure—
the better the seal

NOTHING

GETS PAST

Hallprene

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the seals that pressure can't lick

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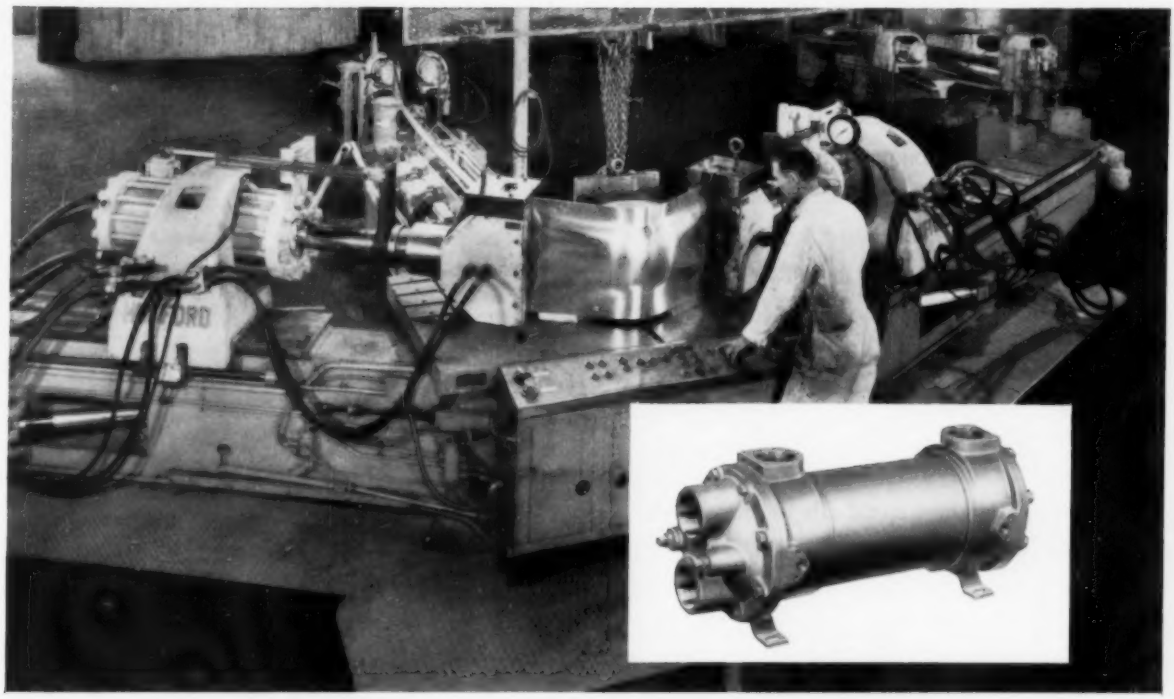
hydraulic fluid cooled by Ross Exchangers



Radar reflectors pulled into shape with 118,000 pound stretch

Shaping aluminum radar reflectors, this Hufford Hydraulic Stretch-Wrap Forming Machine exerts up to 118,000 pounds of pull with its powerful jaws. With the metal drawn to its yield point and wrapped around a stationary die, curvature is compounded in two directions without wrinkles.

To maintain consistent hydraulic pressures by preventing pump slippage from overheated, thinned oil, a Ross Type BCF Exchanger was installed as original equipment. Even under highest pressure, hydraulic temperature remains within desired limits. *Efficient cooling is assured.*

Says Hufford Machine Works, Inc., "Ross Exchangers are compact, easy to install and perform satisfactorily . . . We have been using them for years."

First in ruggedness and high thermal efficiency, Ross Exchangers are regularly furnished with practically every type and make of hydraulic machinery: die casters, metal drawing presses, extrusion presses, gear shapers, powdered metal presses and fluid drives.

Recently redesigned, Ross Type BCF Exchangers feature *new* flanged-lip baffles for tighter tube fit and improved thermal characteristics, *new* movable feet for easy installation, *new* materials, *new* sizes and capacities in one, two or four pass designs.

For detailed information on these pre-engineered, fully standardized units, use coupon below to request new Bulletin 1.1K6

TO:

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American-Standard*
Industrial Division
Detroit 32, Mich.

Please send, without obligation, your new Bulletin 1.1K6 describing the redesigned Ross Type BCF Heat Exchanger.

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AMERICAN BLOWER PRODUCTS • KEWANEE PRODUCTS • ROSS PRODUCTS

Big switch to premium hydraulic oils proves performance repays extra initial cost

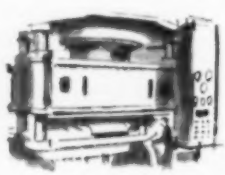
Seminars all over the country have caused many manufacturers to switch to premium grade hydraulic oil as their most *economical* choice. With a premium grade product, like Texaco Regal Oil R&O, they get positive hydraulic action, lower replacement and maintenance costs, greater overall dependability—advantages which more than compensate for the extra initial cost.

A premium grade hydraulic oil is designed to pick up where straight mineral oils fall short. For example, Texaco Regal Oil R&O is inhibited against rust and oxidation. That means no rust particles or sludge to clog tiny orifices and bring production to a halt. Parts life is extended; fewer replacements are needed. And you can make significant savings in manhours, because Texaco Regal Oil R&O gives longer intervals between scheduled overhauls.

You get fewer rejects, too, because Texaco Regal Oil R&O is fortified against foaming, so hydraulic action stays dependably steady and uniform.

You can get more facts on Texaco Regal Oil R&O by calling the nearest of the more than 2,000 Texaco Distributing plants:

Or, write to The Texas Company, 135 East 42nd Street, New York 17, N. Y., Dept. H-H-21.



LUBRICATION IS A MAJOR FACTOR IN COST CONTROL

TEXACO

APPLIED Hydraulics & Pneumatics

MAY 1959

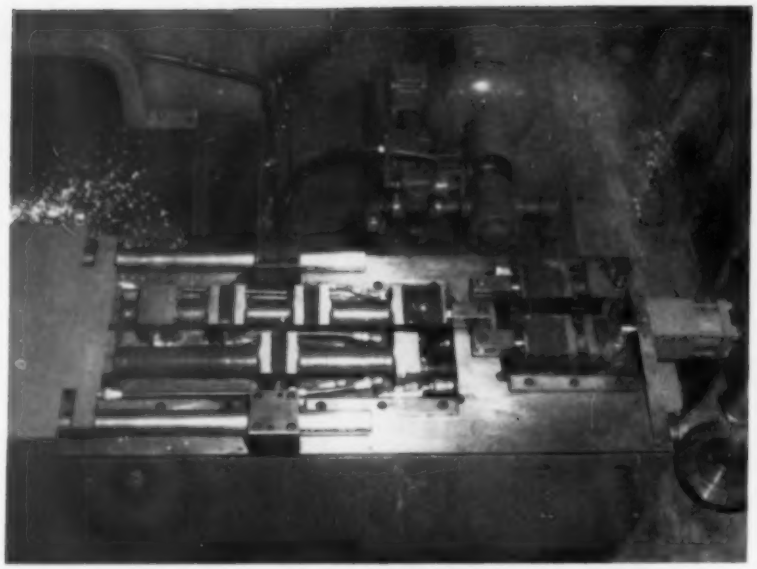
18 DESIGN STUDIES IN INDUSTRIES USING FLUID POWER

THE 18 DESIGN ARTICLES in this issue emphasize fluid power as a universal tool. Regardless of the equipment, or where it's used, if you need a rotary or straightline motion, hydraulic or pneumatic actuation may be the best way to get it. More and more designers are finding that out.

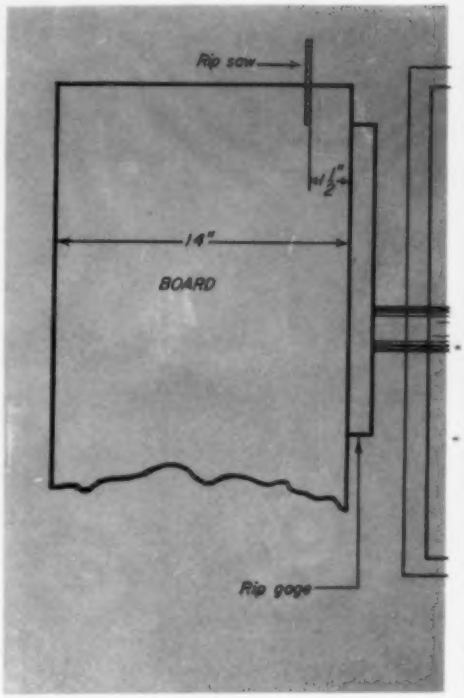
They're even using it in industries where fluid power used to be taboo. Textile, Food Processing, Printing, ten years ago engineers in these fields would have tried almost anything before an oil system. But today they're taking good advantage of the force and speed control offered by hydraulic and pneumatic systems.

• **Better Components**—The reason, of course, is the improvement in components. Fluid power is leakproof enough for an operating room, reliable enough for an ICBM, powerful enough to lift an oil drilling barge, and cheap enough to help migrants pick tomatoes. Sequence valves can cycle machine operation where you can't use electrical controls. Variable displacement fluid motors can give just the speed-torque relation that's needed in winding a web. Boosters can give high force without large components or high pressure pumps. Cylinder combinations can give pushbutton selection of stop positions. These are some of the capabilities of fluid power shown in these design studies from 18 industries.

Each design has been worked out to solve a particular problem: timing food through a pasteurizer, maintaining yarn tension and speed, rapidly adjusting a rip saw. Yet each design has ideas for many other machines, perhaps one of your own.



CYLINDER LAYOUT is compact and makes possible many gage positions.



RIP GAGE is positioned for a 1½ inch cut. The 9 inch and 3 inch stroke cylinders in the tandem units and the 1 inch toggle cylinder have been operated. Identifying numbers at cylinders and solenoids indicate stroke of each cylinder.

WOODWORKING

Tandem cylinder circuit

• By GUST PETERSON, *Engineer, Mattison Machine Works, Rockford, Ill.*

IT only takes the press of a button to select the rip width on a saw equipped with a hydraulically positioned gage. Many widths can be designed into a machine. Selection of the cylinder combination and electrical circuit depends on the rip widths wanted by the machine user. The cylinder arrangement shown in the circuit and photos will give the widths charted in Table I. These machines are designed and built by Mattison Machine Works, Rockford, Ill.

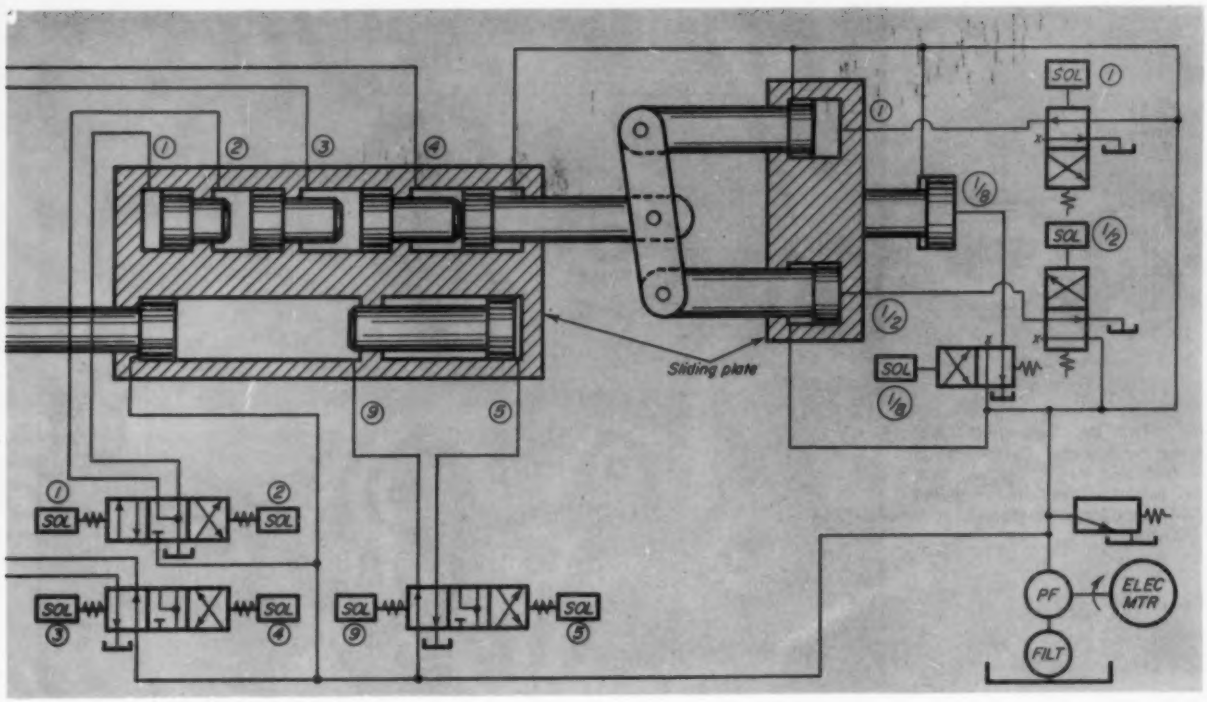
Designing with tandem cylinders instead of a series of separate cylinders saves considerable space and cost. The rip gage circuit has a main hydraulic unit with two tandem sections side by side on a sliding plate. Each section's strokes are shown on the drawing. One piston rod connects to the rip gage, the other to the toggle bar. The toggle bar cylinders are also mounted on a slideable plate so that they can be moved as a unit by a ⅛ inch stroke cylinder.

These toggle bar cylinders give the fractional inch movement of the rip gage. Because of the toggle mechanism the actual movement imparted to the rip gage is only half the travel of the toggle bar cylinder. That is, stroking the 1 inch cylinder moves the gage ½ inch; stroking the ½ inch cylinder moves it ¼ inch.

• **Differential circuits**—The longest stroke cylinder in each tandem unit and also the toggle bar cylinders are connected in differential circuits. System pressure is always on the rod end. This speeds the operation since oil from the rod end helps to extend the cylinders. Valving is also simplified. The rest of the tandem cylinders are single acting. All cylinders are returned by the differential lead cylinder.

• **A Button for Each Width**—Through relay contacts any combination of valve solenoids can be energized by one pushbutton to those cylinders that will give the desired board width. The circuit drawing shows gage position for a 1½-inch board. Table I shows that the 9-inch and 3-inch stroke cylinders in the tandem units must move along with the 1-inch toggle cylinder. This will move the gage 12½ inches. Since 14 inches is the maximum rip width, this selection gives the desired 1½ inch cut.

• **Electrical Locking**—Moving the board through the saw trips a limit switch that locks the gage setting. The operator can push a button for a different



changes board width on rip saw

TABLE I

Cylinder action to give selected rip width. By adding pushbuttons and relays other widths could be obtained with the same hydraulic circuit.

Selector button	Main cylinder combination	Toggle cylinder combination	Total travel
1/8"	9 and 4	1 and 1/2 and 1/8	13 7/8"
1 1/4"	9 and 3	1 and 1/2	12 3/4"
1 1/2"	9 and 3	1	12 1/2"
1 3/4"	9 and 3	1/2	12 1/4"
2"	9 and 3		12"
3"	9 and 2		11"
4"	9 and 1		10"
5"	5 and 4		9"
6"	5 and 3		8"
8"	5 and 1		6"
10"	4		4"
12"	2		2"

width rip and as soon as the first board passes the locking switch, the gage will move to the new setting. A time delay relay prevents action of the locking switch by the second board until the gage has moved to its selected position. □□□

EACH PUSHBUTTON selects a specific rip width.

THE TRITON, launched last spring by General Dynamics, is the fifth and largest nuclear sub. This twin-reactored, radar picket is 447 feet long. Displacement is 5,000 tons.

MARINE

Atomic submarines use electrohydraulic

• By KENNETH S. KNAPTON, JR., *Product Manager, Hydraulics,* and DUDLEY B. HARTUNG, *Application Engineer,*

NUCLEAR-POWERED submarines are fast and maneuverable. They need steering and diving controls much more precise than the unsophisticated, manual ones of World War II submarines.

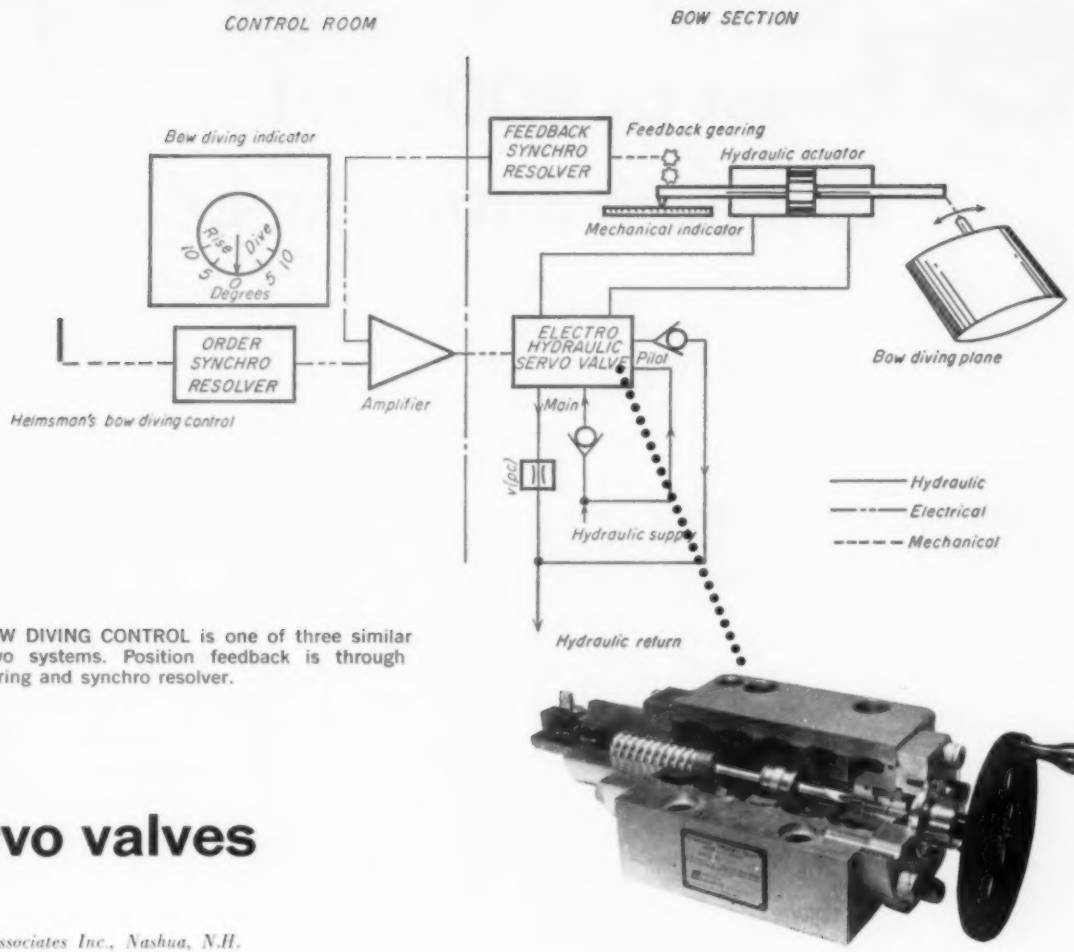
The new control systems resemble aircraft controls. The hearts of the systems are electrohydraulic servo valves that convert small electrical control signals into accurately metered oil flows that move the steering and diving actuators.

The Nautilus was the first nuclear-powered submarine to use a high-response, closed-loop steering and diving system. Mechanical input servo valves were used. The Seawolf, which required a much more refined electrohydraulic control system, was the first submarine to use electrohydraulic servos.

A submarine has three main servo systems for controlling the rudder, and the bow and stern diving planes.

• **System Operation**—When the helmsman moves the control lever to change angle, he rotates the order synchro resolver which converts this motion to a small electrical signal. The amplifier converts this signal into an output current which operates the servo valve. Oil is metered to the actuator in proportion to input current. The feedback gearing rotates a synchro resolver according to actuator position. An electrical signal from this resolver is compared with the signal from the order synchro resolver. These cancel when the diving planes reach the required angle.

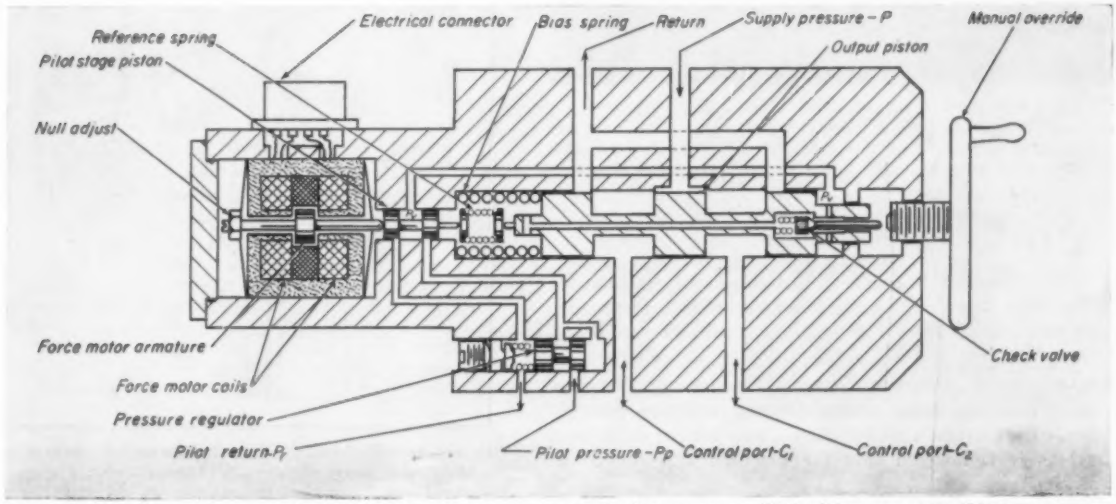
• **Valve Design**—The servo valve is a 2-stage, hydraulic amplifier. The force motor converts input current into armature movement. The armature displaces a pilot piston that is supplied with constant pressure hydraulic fluid. Displacement of the pilot piston varies the pressure P_v connected to one end of the output piston. This causes a force unbalance relative to the bias spring and displaces the output piston. Position of the output piston is fed back, through a reference spring, as force on the armature. When the feedback force equals input armature force, the pilot piston is re-nulled, and force due to pressure, P_v balances the bias spring force. The output piston directs a constant flow through ports C_1 and C_2 to the load. □□□



BOW DIVING CONTROL is one of three similar servo systems. Position feedback is through gearing and synchro resolver.

servo valves

Sanders Associates Inc., Nashua, N.H.

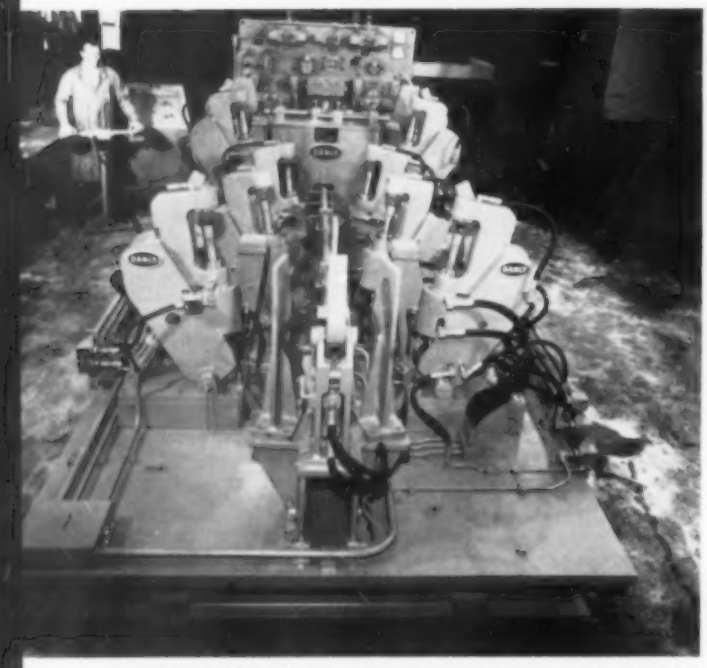


SERVO VALVE has pressure reducing valve to maintain constant pilot pressure. Pilot piston connects this pressure or drain to right end of control spool. Hand wheel operates valve if controls fail. *Courtesy Sanders Associates, Inc.*

AUTOMOTIVE

Boost to 5000 psi to pierce auto frames

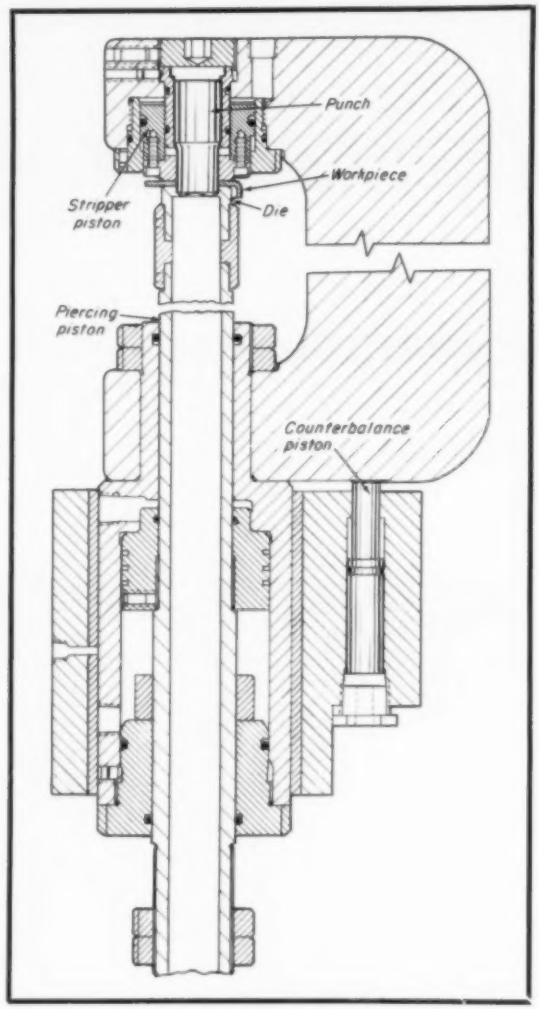
• By JOHN R. DANLY JR. and CECIL E. NOVINGER
Danly Machine Specialties, Inc., Chicago, Ill.



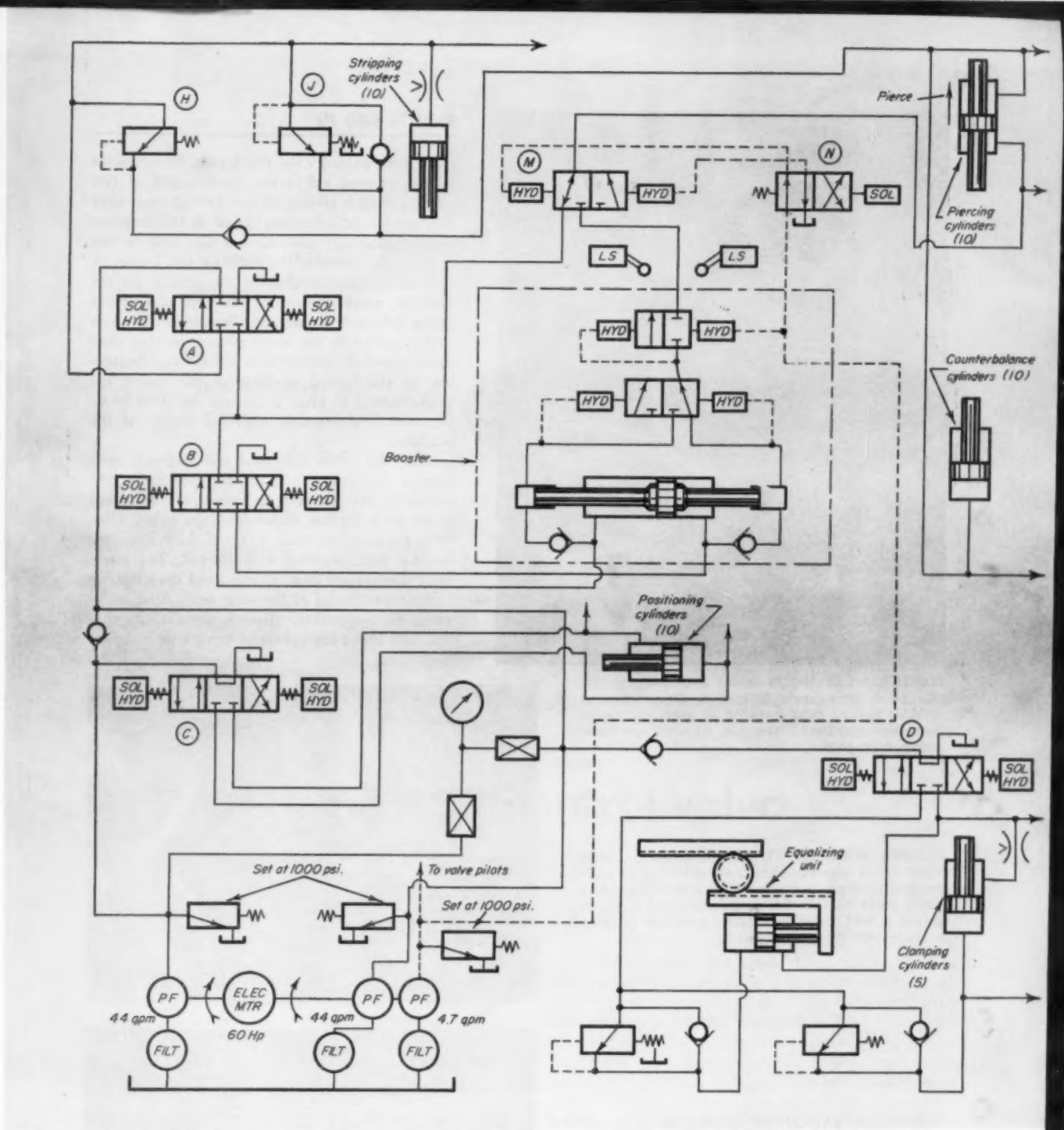
PIERCING MACHINE punches ten holes in auto frame body brackets. Design of piercing units, which act upward, speeds loading and unloading of the machine. Limit switches sense completion of each cylinder action to sequence the machine cycle.

A RECIPROCATING booster in this special machine for piercing auto frame body brackets raises pressure five times to get high force and still keep cylinder size down. To speed loading and unloading, the piercing cylinders are designed into a swing-out C-frame. The arrangement of a cylinder mounted below and a stripping cylinder mounted above in the C-frame requires the least amount of work-piece travel as it is lowered into the machine and raised out of it after piercing.

In the past, the body brackets were pierced before being



HOLLOW PIERCING PISTON is shown at completion of work stroke. Slugs fall through the piston to a scrap conveyor. Stripper piston moves 7/16 in. to strip part off punch. Pierce cylinder has 4-in. bore.

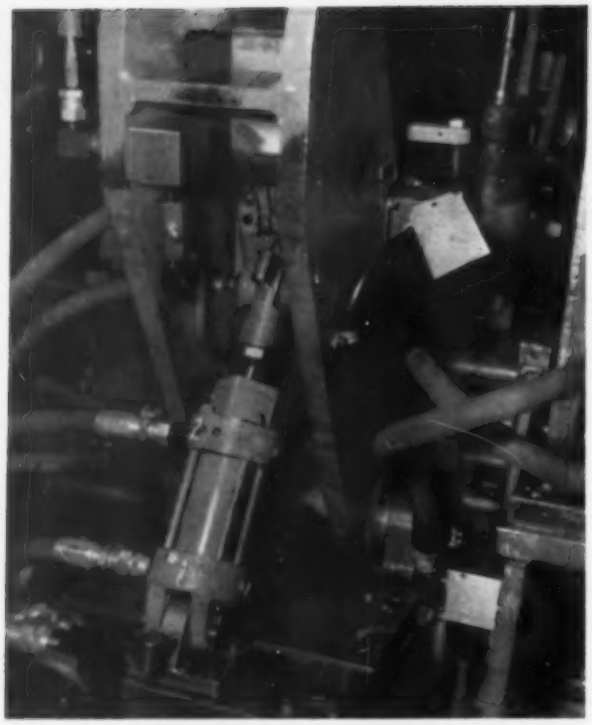


CYCLE IS STARTED when pushbutton actuates valve **D** extending equalizing and clamp cylinders. Valve **C** then shifts to extend positioning cylinders, bringing piercing units in place. Valve **A** then directs fluid through valve **M**, traversing the piercing cylnders to the work. When they contact the work, valve **N** is actuated directing pilot fluid to valve **M** which shifts and connects booster output to the piercing cylinders. At the same time valve **B** shifts to connect pump output to the booster. Piercing continues at 5000 psi boosted pressure. When it is completed, valve **B** centers, blocking flow to the booster, and valve **A** shifts to direct pump flow through pressure reducing valve **H** to return side of piercing cylinder pistons as they are pushed back by the stripper pistons. Valve **N** is de-energized, and valve **M** shifts to connect exhaust flow from the piercing cylinders to tank through valve **A**. Valve **M** has a decompression spool which will not allow main spool to shift until high pressure oil is bled to a predetermined pressure. Sequence valve **J** is set just above the pressure required for stripping. When stripping is completed, valve **J** opens to direct pump delivery to the piercing cylinders, bypassing pressure reducing valve **H**.

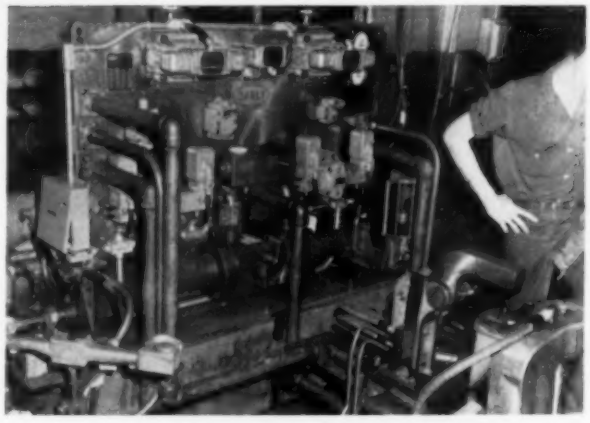
When the piercing cylinders are back, valves **C** and **D** shift to retract the positioning, clamping and equalizing cylinders completing the cycle.

riveted or welded onto the frame. Inaccuracies in this process led to the development of this machine which pierces all brackets at once after they are assembled on the frame. In this instance the manufacturer has allowed one hole in the front cross member for locating the frame. A cylinder-actuated equalizing mechanism on the machine quickly positions the rear end of the frame before it is clamped. This design has two shafts geared to the same pinion, so that they move together in opposite directions. Regardless of the loaded position of the frame, the shafts extend to pivot it around the front locating hole and align it with the center of the machine.

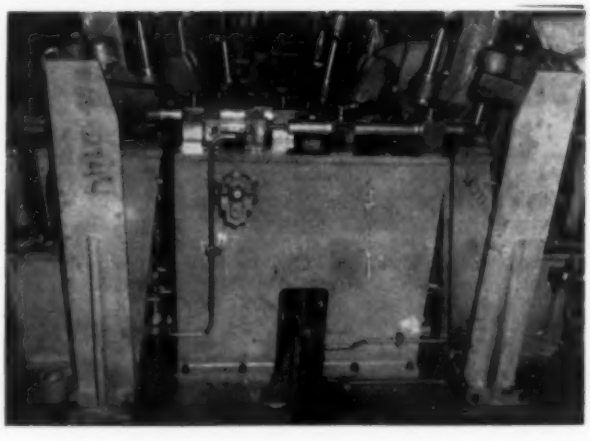
After the frame is located and clamped, positioning cylinders swing the piercing units into position. The piercing cylinders are traversed to the work by flow direct from the pump. Then they are supplied with 5000-psi fluid from the booster until piercing is completed. The piercing cylinders are then retracted and the stripping cylinders extended at the same time. After stripping, the positioning cylinders, equalizing cylinder, and clamping cylinders retract to complete the cycle. □□□



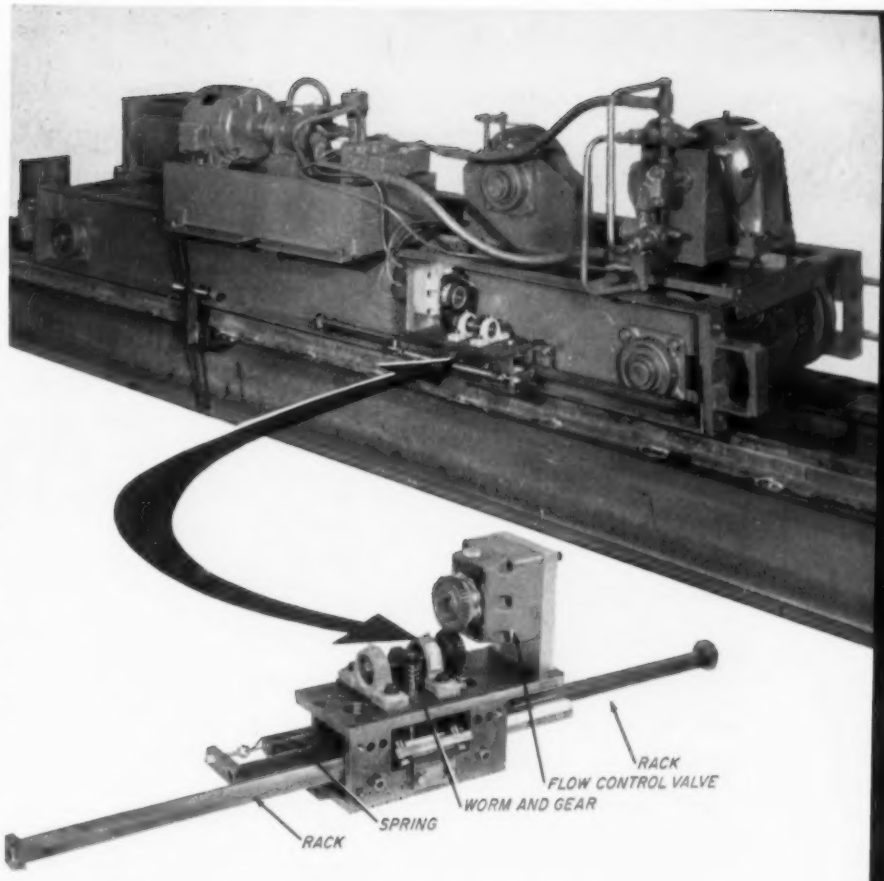
POSITIONING CYLINDER moves each piercing unit into place after frame is loaded. Clevis-mounted cylinder has oil cups installed at each bearing to keep them lubricated. The 2-in. cylinder has cushions at both ends.



RECIPROCATING BOOSTER is mounted on valve panel above reservoir. Limit switches trip at each extreme position, and actuate separate 4-way valve which ports fluid to the booster. Internal 2-way in output is held closed by external pressure. It opens when booster operation begins.



EQUALIZING MECHANISM is actuated by 1½-in. cylinder which drives positioning bars. These are geared together. Regardless of initial loaded position of frame, positioning bars move it to centerline of machine.



A rack and pinion feeds back the linear position of an overhead crane to control acceleration and deceleration. The pinion opens and closes a flow control valve through a set of reduction gears.

FOUNDRY

Deceleration with a flow control valve

• By FRANK V. ACTON, *Staff Engineer, Barnes & Reinecke, Inc., Chicago, Ill.*

ACCURATE positioning of an overhead crane is important when assembling copes and drags in a foundry. Starts and stops must be smooth to prevent shifting or swaying of the finished molds. Because of the long distance required for deceleration, and the heavy mass, Barnes & Reinecke designed mechanical actuation for a flow control valve to control starting and stopping speed. Standard components were used throughout.

The acceleration-deceleration unit has two opposing sliding racks meshing with a single pinion gear. A tension spring keeps the racks fully extended. When either rack is pushed in, the pinion gear rotates. This rotation is transmitted through reduction gears, to gradually close a flow control valve in the discharge line from the hydraulic drive motor.

• **Operation** — A constant-displacement hydraulic motor drives the overhead transfer dolly along the tracks. The pump, electric motor, and control valves move with it.

To stop the dolly at fixed positions, air cylinders force blocks against the track. These blocks serve as positive stops for the dolly. The cylinders also position stops for the rack. As the dolly moves into position, the rack hits its stop and is held. The dolly continues to move. As the rack is pushed in it rotates the pinion gear. This gradually reduces fluid motor speed, and the dolly bumper eases into a fixed stop. A small flow through the flow control valve, (approximately 5% of full flow), permits the fluid motor to hold the dolly against the stop. This residual flow also provides the initial volume for acceleration when the direction of the dolly is reversed. Deceleration is varied by adjusting the position of the rack stop.

Actuating a 4-way solenoid valve reverses flow to the fluid motor. A spring holds the rack against its stop as the dolly moves away. This relative motion opens the flow control valve, and the dolly gradually accelerates. When the rack moves off its stop, the dolly travels at constant speed until the opposite rack hits its stop. □□□

FOOD PROCESSING

Sequencing a walking beam

• By VAL A. MAYER, *Assistant Chief Engineer, Barry-Wehmiller Machinery Co., St. Louis, Mo.*

Keeping a food processing plant clean is hard on electrical controls like limit switches and solenoid valves. Equipment is hosed down with steam after each shift. This hydraulic system which actuates a beer pasteurizer is pilot operated by a mechanically actuated rotary valve, and sequence valves.

CONVEYING food products like bottles of beer through a pasteurizer must be done smoothly to prevent upsetting them. Speed of the conveyor must be easily changed to accommodate different products. The hydraulic pasteurizer designed and built by Barry-Wehmiller accomplishes both of these with cushioned cylinders and a temperature and pressure-compensated flow control valve.

The machine pasteurizes two lines at once—one over the other. The products move on a walking beam, consisting of alternate moving grates. One grate in the raised position carries the product forward while the other grate, at a lower level, moves in the opposite direction. At the completion of the forward move, the grates exchange levels; the grate at the lower level raises and the other lowers, then the forward moving cycle is repeated. The two lines are interconnected hydraulically, so the action of one sequences the other.

• **Walking cycle**—prime mover is a vane type, fixed displacement pump and sump unit, with a flow control valve connected to a meter in circuit to adjust conveying speed.

1. Conveying cylinder *C* is mechanically linked to the rotary pilot valve *AA*, so that when the piston moves, a set screw on the piston rod trips the valve. Pilot fluid then shifts 4-way valve *BB* so that fluid is directed to elevating cylinder *A*, which raises grate *A*.

2. When cylinder *A* reaches the end of its stroke, pressure builds up to the setting of sequence valve *DD*. Fluid flows through valve *DD* to elevating cylinder *B*, which lowers grate *B*.

3. As cylinder *B* reaches the end of its stroke, the increased pressure passes pilot fluid through sequence valve *EE* to the 4-way valve *FF*. This action permits oil to drain from the head ends of the conveying cylinders *C* and *D*, since pressure is always applied to their rod ends, they both retract. As both cylinders move simultaneously, grate *A* moves forward while grate *B* retracts.

4. When grate *A* ends its forward travel, its linkage trips the rotary pilot valve, which actuates 4-way valve *BB*. Supply fluid then flows to elevating cylinder *B* which raises grate *B*.

5. As cylinder *B* ends its stroke, pressure buildup passes fluid through sequence valve *GG* to elevating cylinder *A*, which lowers grate *A*.

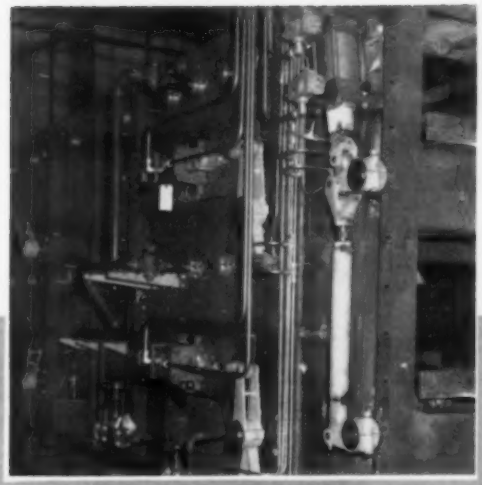
6. When cylinder *A* builds its maximum pressure, fluid is allowed through sequence valve *HH* to actuate the 4-way valve *FF*. Pressure fluid is then applied to the head ends of cylinders *C* and *D* as well as to the rod ends. Because of the difference between head end area and rod end area, the cylinders extend. Both cylinders move simultaneously, so that grate *B* moves forward while grate *A* retracts, completing the cycle.

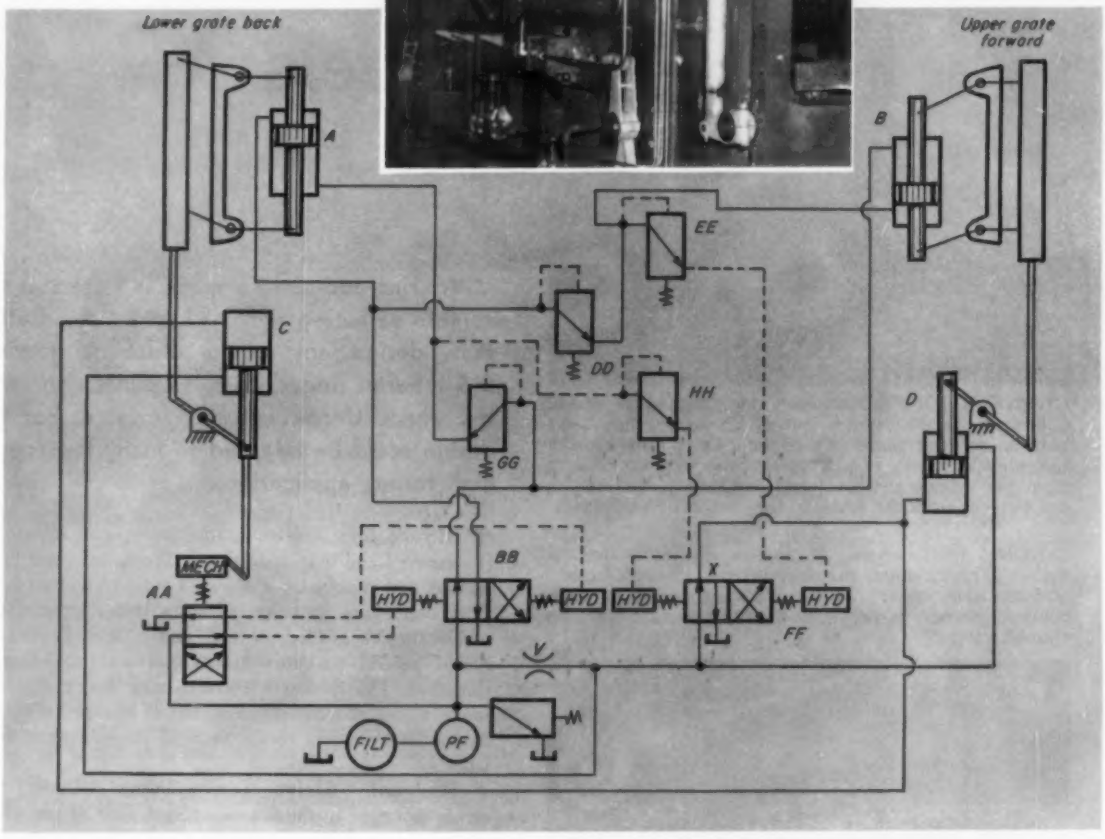
The rotary pilot valve is the key component in the system. As the conveying cylinders end their stroke, the pilot valve is made to select the proper valve channels for actuating the elevating cylinders. Timing may be adjusted by a pair of limit set screws which contact the tripper of the pilot valve.

Cylinders that convey one grate and elevate another, act simultaneously. Torque shafts and gear segments are employed so that while one grate is moving forward the other is retracted. Each grate moves forward at the same speed even though the cubic displacement of the cylinder ends differ. The 2:1 pressure differential between the working ends of the two cylinders, due to the opposition of the rods, is overcome by a cross line between the head end of one and the rod end of the other, so that one grate is moved forward, while the other is retracted.

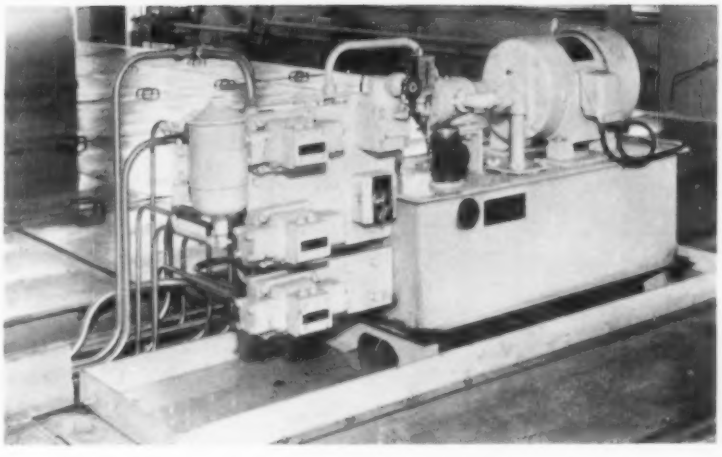
Typical of hydraulic systems, actuation of the walking beam is extremely smooth and free of friction and vibration in contrast to mechanical drives □□□

conveyor





MECHANICAL LINKAGE from cylinders to grates is diagrammed on circuit. Upward movement of cylinders **A** and **B** lowers the corresponding grate. Downward movement raises it. Cylinders **C** and **D** traverse the grates back and forth.



HYDRAULIC POWER PACKAGE mounted on top of the pasteurizer. Flow control valve is accessible for speed adjustment. Stainless steel tubing offers protection in humid atmosphere during operation and cleanup.

AGRICULTURE

Reciprocating cylinders power drive wheels

• By WALTER S. KLEMENTS,
B & L Farms, Princeton, Florida

CYLINDERS MOUNTED on each side rotate drive wheel. Cylinders are 90 degrees out of phase so they can't both be on dead center at one time. Cams rotating with the wheels operate 4-way valves directing oil to and from the cylinders. Hose lines increase in diameter as the distance from the wheel to the central unit increases.

CENTRAL UNIT where all speeds are controlled. A hydraulic motor drives the conveyor belt through a chain and sprocket speed reducer. Forward speed of each conveyor section is varied by throttling a hand-operated shut-off valve.

Walking-and-picking speed is as fast as this tomato gathering machine has to move. Rather than design any speed reducing gearing, B & L Farms rigged up two cylinders to crank the wheel. Unconventional, for sure, but the design could be adapted to many low speed, high torque applications.

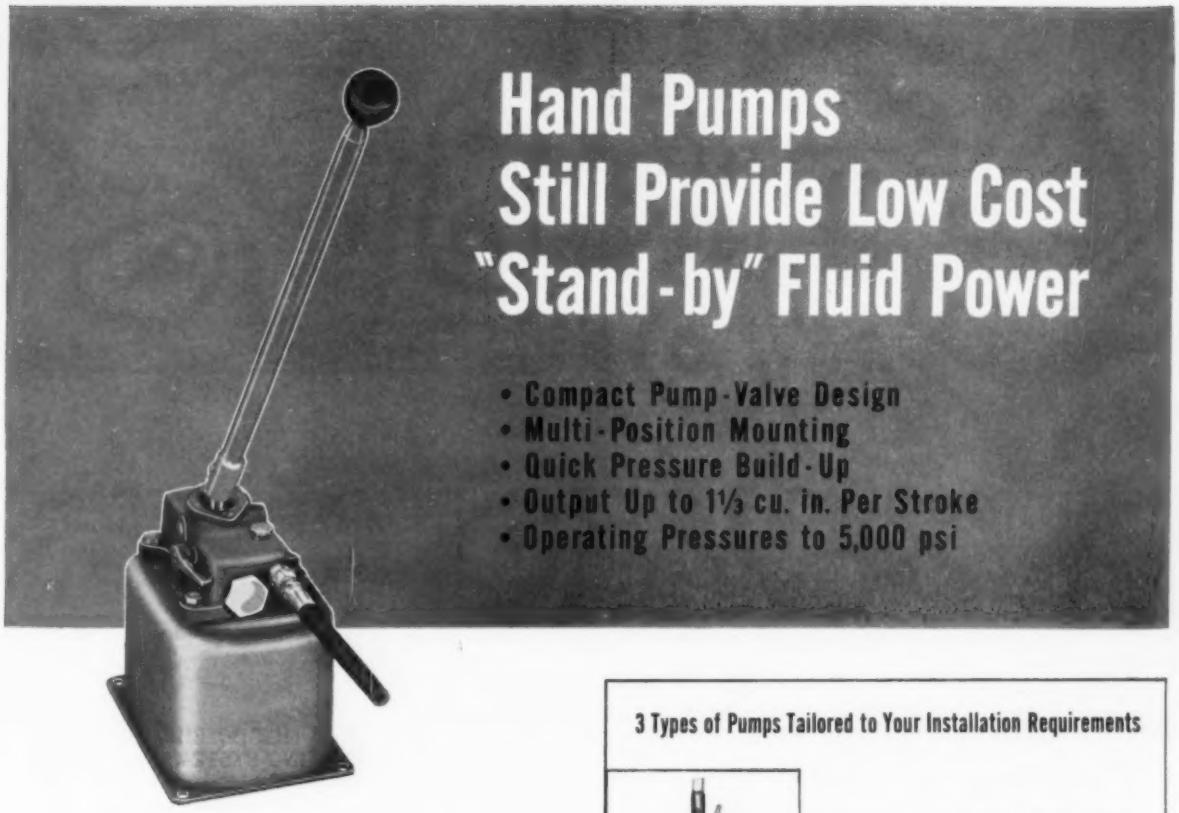
THIS mobile tomato gathering plant eliminates many handling operations. Tomatoes are hand picked and dumped on one of two, 130-ft conveyors. Both conveyors feed the tomatoes into a central unit where they're graded, sorted, and boxed. Trucks are towed behind the unit to carry away the boxes of tomatoes. The conveyor sections and the central unit move along at slow speed ahead of the pickers. Two hydraulic cylinders rotate each of the conveyor drive wheels.

• **Hydraulic Drive**—Double-acting cylinders are clevis mounted to the frame on each side of the wheel. Their rod ends are attached to cams that rotate with the wheel. They're connected approximately 6 inches out from the center of rotation of the wheel, with one rod 90 degrees behind the other. This arrangement prevents both rods reaching dead center at one time.

The cams, rotating with the wheels, position plungers on the 4-way valves. These valves direct flow to and from the drive cylinders. The cams are shaped to assure that both cylinders apply torque in the same direction of rotation. Speed of each wheel is governed by throttling a manual valve in the central unit.

A hydraulic motor drives each conveyor belt through a chain and sprocket. The conveyor belt speed is varied by a manual valve controlling flow to the motor.

A gear pump delivers oil at 300 psi to power the system. Valves and cylinders designed for air operation are used throughout to keep costs down. □□□



Hand Pumps Still Provide Low Cost "Stand-by" Fluid Power

- Compact Pump-Valve Design
- Multi-Position Mounting
- Quick Pressure Build-Up
- Output Up to 1⅓ cu. in. Per Stroke
- Operating Pressures to 5,000 psi

COMMERCIAL hydraulic hand pumps are expressly engineered for installation on lower cost, utility equipment sold for intermittent or "stand-by" service.

Typical applications are: (a) small highway trucks requiring a pump to operate cylinders that position snowplow blades used only seasonally, (b) fork-lift trucks, (c) tilt bed trailers, and (d) rotary tillers.

COMMERCIAL hand pumps are operated with little manual effort, and because they occupy small envelope space can be mounted in the most convenient operating position.

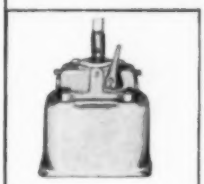
Many quality features insure trouble-free service often beyond the life of the equipment on which they are installed. Features such as: renewable steel check valve seats; pump plunger seats that absorb wear and can be easily replaced; stainless steel, spring-loaded check balls; and full porting to maintain ample oil supply.

All expendable parts are relatively inexpensive, readily obtainable and easily replaced.

Hand Pump Performance Data

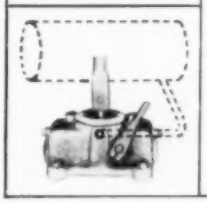
Model Number	Piston Dia.	Delivery Per Stroke (cu. in.)	Required Force (lbs.) on Pump Handle at Various Circuit Pressures (psi)					
			1000 psi	1500 psi	2000 psi	3000 psi	4000 psi	5000 psi
B301	9/16"	.2485	16	24	32	48	64	80
B304	3/4"	.4418	28	42	56	84	—	—
B307	1-5/16"	.6903	44	66	88	—	—	—
B309	1-5/16"	1.353	88	—	—	—	—	—

3 Types of Pumps Tailored to Your Installation Requirements



(A) Complete unit: Hand Pump-Valve, and integral oil tank in either ½ gallon or 1 gallon capacity. Four holes in base for mounting.

(B) Hand Pump-Valve . . . for top mounting to your tank.



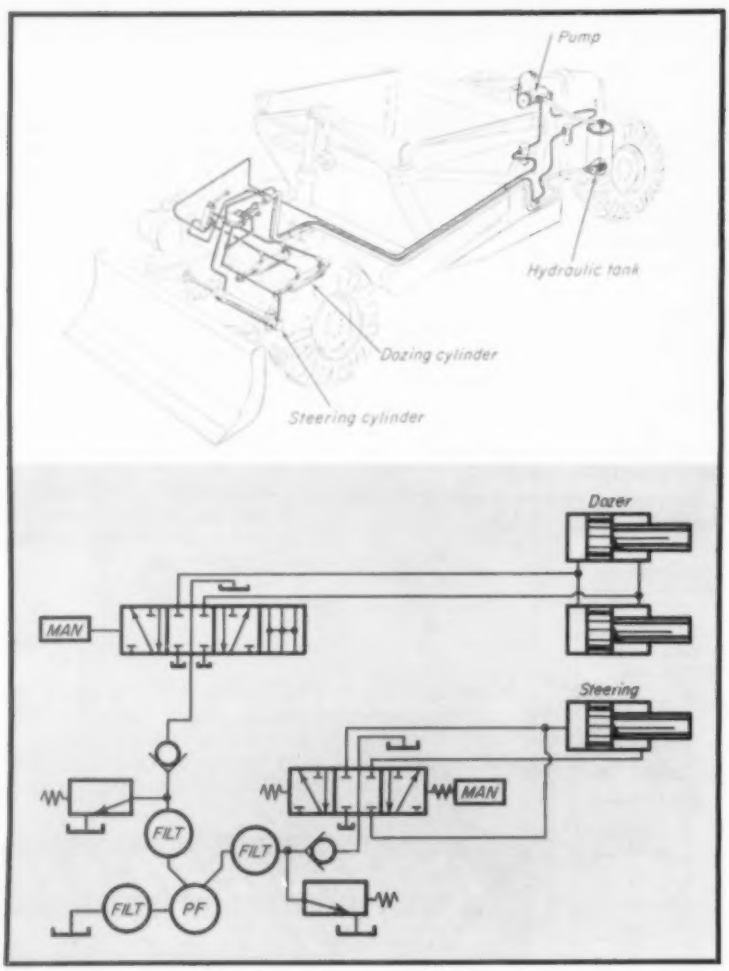
(C) Hand Pump-Valve . . . with ¼ inch pipe tap at side of pump for connecting your low pressure hose and remote supply tank.

If you need a low initial cost, simplified hydraulic system to position components on your original equipment, it might well pay to investigate the COMMERCIAL line of long-life hand pumps and cylinders. Write for free Catalog H-1. Address: Commercial Shearing & Stamping Company, Dept. A-18, Youngstown 1, Ohio.

COMMERCIAL shearing & stamping

CONSTRUCTION

Air controls oil power on Army's



1 THE DOZER AND STEERING SYSTEMS are designed for 6000-psi operation to keep pump, cylinders lines, and other components small, making the machine light and compact.

Output flow from the axial piston pump can be separated into 10 circuits—one from each piston. For this application, two separate circuits are taken from the pump. With the pump running at 2600 rpm, three pistons deliver 4.2 gpm to the steering circuit, and seven pistons deliver 9.8 gpm to the dozer.

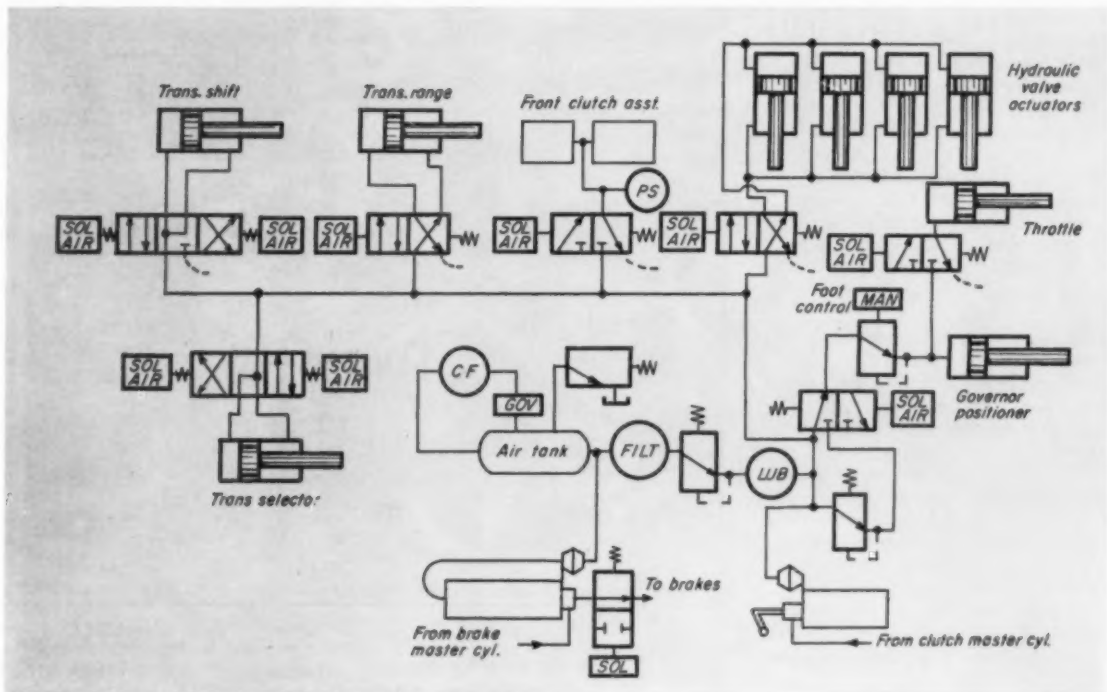
A 3-position, 6-way, directional valve with integral relief controls steering. This valve has a regenerative feature to keep speed of the steering cylinder the same in both directions. Rod area of the cylinder is one-half bore area. To extend the cylinder, oil from the rod side of the cylinder joins with the pump oil; to retract the cylinder, only pump oil is used. A complex, servo valve is not needed for steering, because metering characteristics of the directional control valve are adequate. No feedback is needed.

The dozer circuit is powered by seven of the pump pistons and controlled by a 6-way directional valve. This manually operated valve incorporates a ball check and relief valve set at 6000 psi. Hydraulic cushions in the two dozer cylinders reduce the transfer of shocks through the cylinders into the machine structure. A common return line for the steering and dozing

Design an earthmoving machine that dozes grades, and scrapes; is simple to operate and maintain; can be airborne. Those were the design objectives for this Ballastable All-Purpose Tractor (BAT). It weighs 16,000 lb empty, 32,000 lb ballasted with dirt. A special military design, it reduces the number of repair parts which must be stocked. Here are the hydraulic and pneumatic systems for all its operations.

new BAT

• By FRANK A. GLOMB, W. HORACE LEATHERS, JR. and TURNER G. TIMBERLAKE*



systems reduces the number of lines running from the pump at the rear of the machine to the cylinders at the front.

2 THE PNEUMATIC SYSTEM controls hydraulic valves as well as the transmission, engine governor, and clutch, brake assist. With the power package at the rear of the driving vehicle, and the operator at the front, controls had to run the length of the machine. Mechanical linkages were not feasible, because of the tractor bowl between the operator and the power package. Electro-pneumatic controls were the best choice.

An air-cooled, self-lubricated air compressor delivers 7 cfm at a speed of 2300 rpm. The governor is set to unload the compressor at approximately 125 psi.

AIR CONTROLS OIL POWER

The 1500-cu. in. air tank is made of high strength aluminum. Its safety valve is set at 140 psi. Air is supplied to the system through a filter, pressure regulator, and lubricator. The regulator is set at 100 psi.

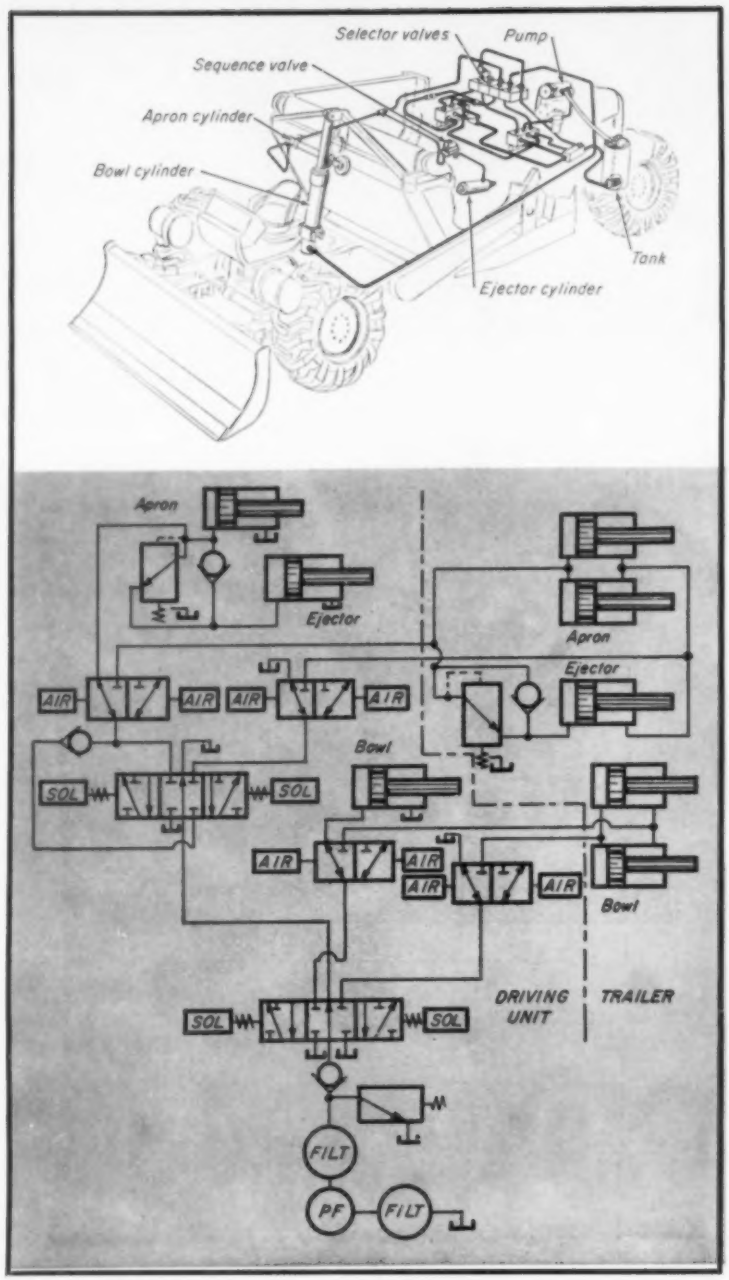
Two transmissions and a 2-speed governor give a speed range from 1.5 to 25 mph. A 5-speed transmission (five forward and one reverse) is actuated by two air cylinders for speed selection and shifting. A 2-speed transmission (low and high range) is actuated by the RANGE cylinder.

Two electric motors drive the front wheels when the 2-speed transmission is in low range and the 5-speed transmission is in first, second, or reverse gear. Air-operated clutches for these motors are actuated together by a 3-way solenoid valve.

A governor positioner regulates engine speed from idle to 3000 rpm. A foot-operated, pressure control valve actuates the positioner with outlet pressures from 10 to 90 psi. To keep engine speed less than 2200 rpm in low range the governor control pressure is limited to 55 psi by a pressure regulator. The output from this regulator is selected by a 3-way valve actuated in the low-range position. To limit torque on the drive train in this speed range, the controlled pressure is also directed through a 3-way valve to the throttle cylinder.

In high range, engine speeds vary from idle to 3000 rpm. The 55-psi pressure regulator is then bypassed and full line pressure applied through the 3-way valve to the foot-operated pressure-control valve.

The master cylinder actuates the clutch through the clutch pedal. To make this easier, pneumatic boost is supplied by the clutch assister. The hydraulic brakes are assisted by multiplied pressure, accurately controlled by force on the brake pedal. A solenoid-operated 2-way valve serves as a parking brake.



3 THE SCRAPER CIRCUITS on the driving unit and trailer operate at 3000 psi. Two, 6-way, solenoid-operated, directional valves control operation of the bowl, apron, and ejector systems. Four, air-operated, 3-way valves are actuated together to direct flow to the trailer scraper system. These valves direct air flow to four, 1⅛-in. cylinders which shift the hydraulic valves. This design keeps weight down.

Sequence valves in both apron-ejector systems insure that the aprons raise fully before the ejectors advance when unloading dirt from the scraper bowls. The apron-ejector directional valve has a regenerative feature to increase cylinder speed by connecting flow out of the rod end back to the head end. This is used only for the trailer system.

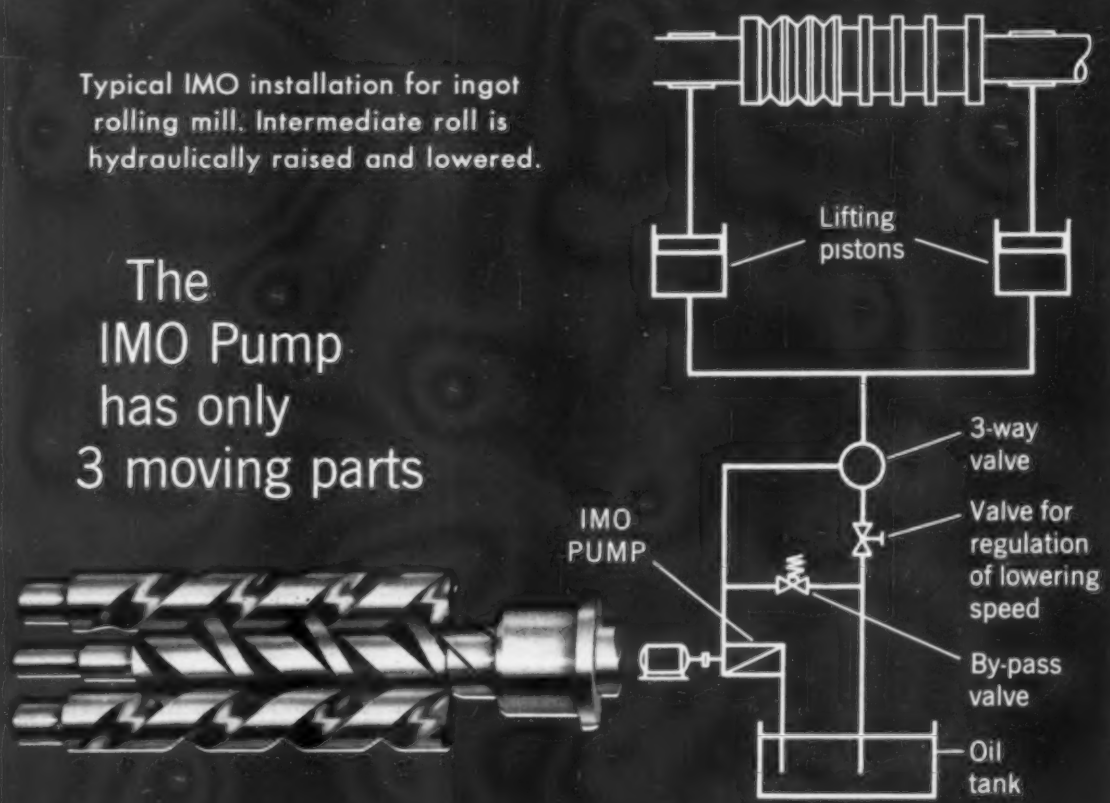
*FRANK A. GLOMB, *Chief Engineer, Barnes & Reinecke, Inc., Chicago, Ill.*; W. HORACE LEATHERS, JR., *Senior Project Engineer, U.S. Army Engineer Research & Development Laboratories, Fort Belvoir, Va.*; TURNER G. TIMBERLAKE, *Chief Mechanical Engineering Dept., U.S. Army Engineer Research & Development Laboratories, Fort Belvoir, Va.*

DE LAVAL IMO PUMPS for Power Hydraulics

If you require a hydraulic pump for actuating any kind of equipment—lifting, tipping, loading, bending, pressing, etc. —consider the IMO. Here are its characteristics:

- **Smooth power flow without pulsation**
- **Can be direct-driven at high speeds without reduction gears**
- **Thoroughly dependable and proved**
- **QUIET, smooth rolling action**
- **Easily installed**

Typical IMO installation for ingot rolling mill. Intermediate roll is hydraulically raised and lowered.

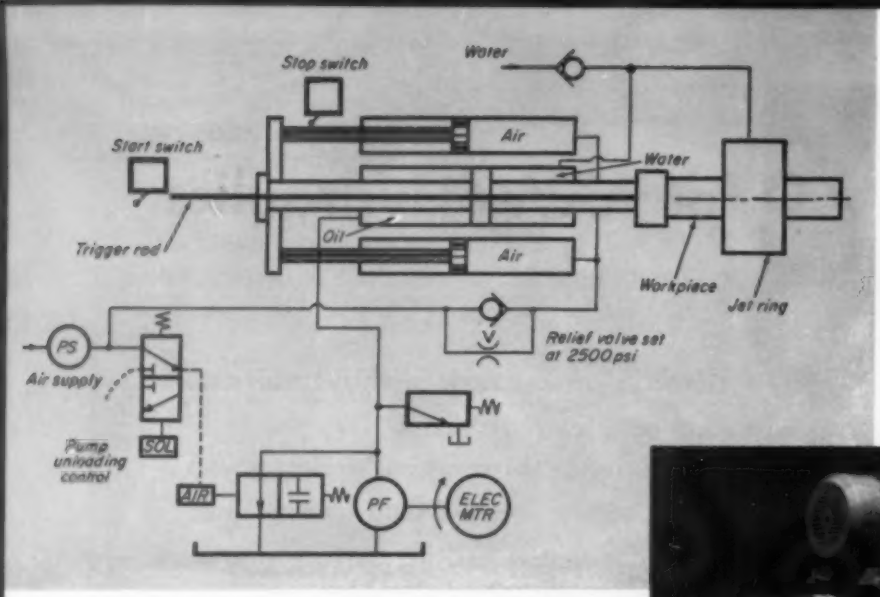


The IMO Pump has only 3 moving parts

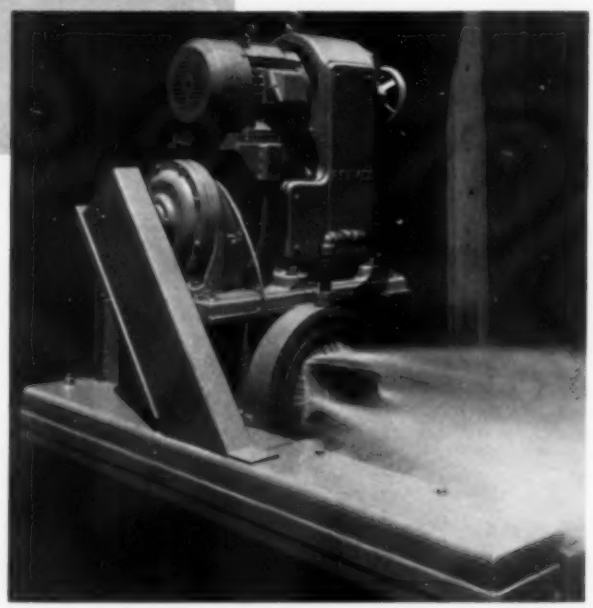
DE LAVAL *IMO Pumps*

DE LAVAL STEAM TURBINE COMPANY
802 Nottingham Way, Trenton 2, New Jersey

DL-455



POSITIONING the workpiece moves the trigger through the converter rod to trip the start switch. Unloading control is energized causing pump to deliver oil to the converter. At end of descaling, stop switch unloads pump and air retracts the converter.



- Use of oil hydraulics creates portable, self-contained unit
- Air pressure unloads pump and retracts "converter"
- Pressure and thermal switches protect system

STEEL

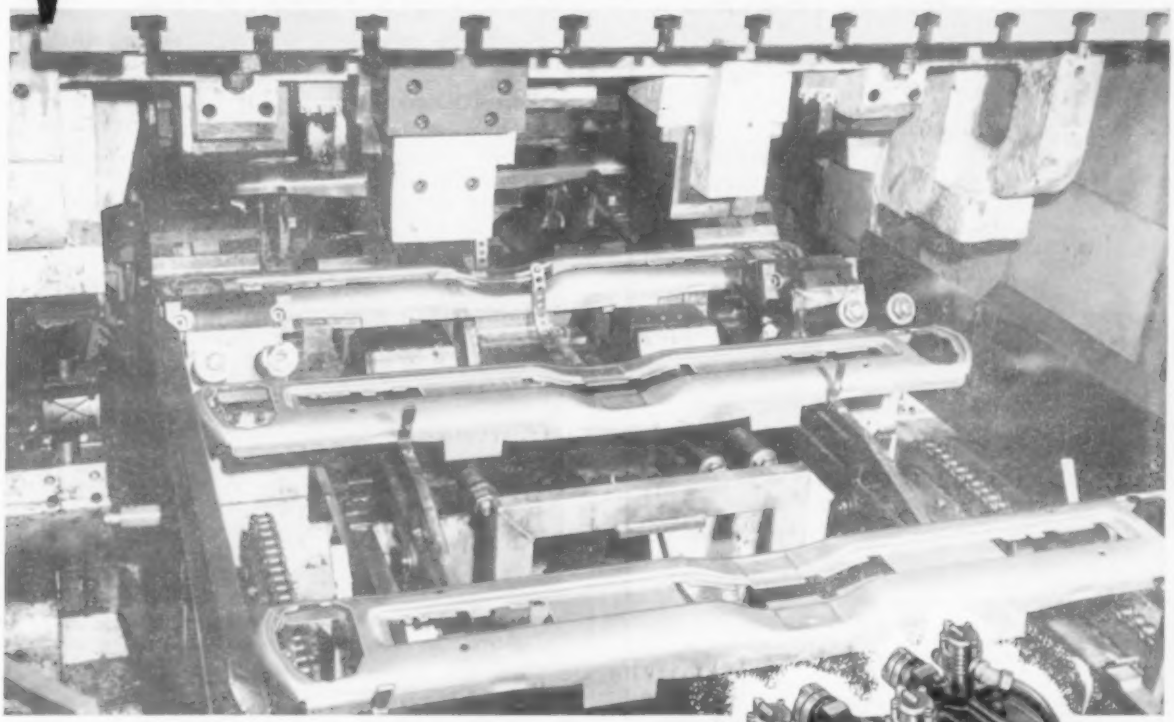
Oil circuit pumps water to descale forgings

WATER at 2000 psi will remove scale formed on a piece of steel which has been heated to forging temperatures. Descaling is done between the furnace and forging machine. Effective descaling requires two things: sufficient pressure and proper application of the water on the surface. The sudden chilling causes the scale to shrink and pop off. On the descaler, designed and built by Commercial Shearing & Stamping, Inc., Chicago, Illinois, an oil hydraulic circuit develops the needed pressure and a jet ring gives the correct spray pattern.

• **Power source**—Oil from a 2500-psi gear pump powers a converter cylinder. Size of the converter is selected to provide enough water to descale the largest and longest workpiece. This simple power system does the job usually performed by central water systems. Such systems use reciprocating or centrifugal pumps to deliver high pressure water to a group of machines. Often large accumulators are included in these central station systems.

Oil delivery to the converter is controlled by an air unloading circuit. A normally open, pilot-operated valve dumps pump volume to tank. When the workpiece is positioned in the descaler it moves a trigger rod which trips the start switch. Through a relay the start switch energizes the solenoid air valve causing the pilot valve to close so

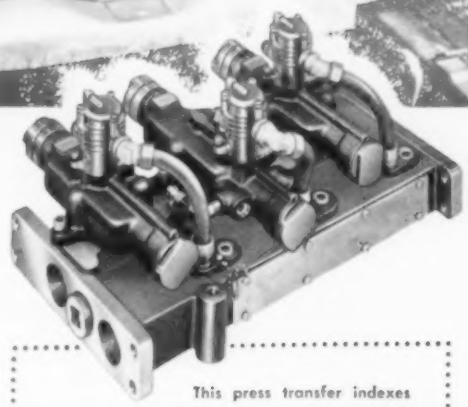
Valvair® deceleration manifolds provide safe, velvet-smooth control of high-speed press transfer shuttles



Performance of Valvair deceleration manifolds on press transfers maintains a steady high rate of production through a major automotive manufacturer's fully-automated 5-press stamping line. Valvair design assures necessary rapid movement of the transfer mechanism, with precisely controlled deceleration of the 200 lb. shuttle at each end of the cycle. And, positive cushioning of shuttle travel prevents damage to the transfer mechanism . . . protects valuable dies.

Valvair's deceleration manifold assembly uses only three SPEED KING valves; two to control cylinder movement, and one as a directional valve to select free or restricted exhaust for cushioning. Just two limit switches are needed to control cushioning action — a quick adjustment of exhaust restriction precisely regulates cushioning rate. Simplicity of design, plus SPEED KING multi-million cycle dependability, assures peak production rates, with minimum in-service downtime.

If control of fast-moving reciprocating mechanisms is a problem in your plant, ask your nearby Valvair representative for his recommendations. He's only a telephone call away.



This press transfer indexes 26 in. per cycle, at a 1,000 cycle/hr. rate. Valvair's compact, 3-valve deceleration manifold controls its horizontal movement . . . requires minimum mounting space . . . simplifies piping and wiring.

For more information, write for Bulletin G-3A. Address Dept. AH559, Valvair Corporation, Akron 11, Ohio.

Representatives in principal cities

Valvair AKRON 11, OHIO

DIVISION OF INTERNATIONAL BASIC ECONOMY CORPORATION (IBEC)

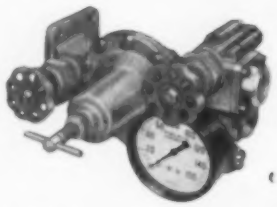
Other INDUSTRIAL DIVISIONS of IBEC: The Sinclair-Collins Valve Co., The Bellows Co., Akron, Ohio • V. D. Anderson Co., Cleveland, Ohio

8018

ENGINEERED MANIFOLDING

BY REPUBLIC

SAVES SPACE
WEIGHT
INSTALLATION COST
MAINTENANCE

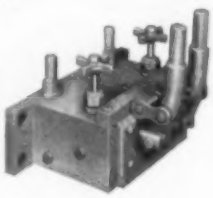


AIR CONTROL MANIFOLDS

Concentrates air controls by combining line shut-off valve, pressure regulator, blowdown valve, check valve, gage shut-off and gage. Eliminates leakage and external connections. Easily maintained. Saves much space and downtime. Units interchangeable. Can be multiple-mounted by use of headers.

DUAL HAND PUMPS

2 double-acting hand pumps, 2 gages, 2 relief valves, and 2 needle bleeder and shut-off valves, completely manifolded, for missile ground support equipment. All valve adjustments readily accessible.



RELIEF MANIFOLD

Pilot-operated relief valve, check valve, flow control valve and by-pass valve combined to facilitate test-stand operation. Gives quick, easy control of both flows and pressures.

● **MANIFOLD COMPONENTS,** engineered for a specific application, is a Republic specialty. Modern design demands a new dimension in space, weight, installation, and service. Let our valve specialists solve your specific compacting problem.

RM REPUBLIC MANUFACTURING CO.
13655 BROOKPARK ROAD • CLEVELAND 35, OHIO

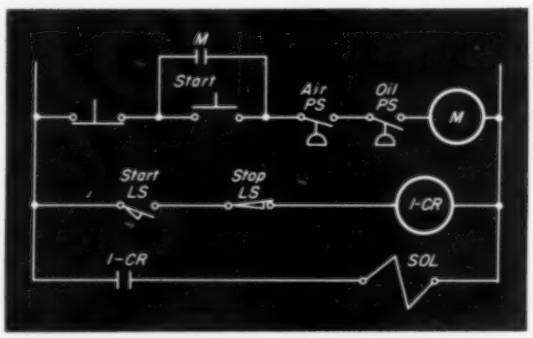
Circle **138** *on Time-Saver Card*

OIL CIRCUIT PUMPS WATER

that the pump now powers the converter. The pilot and solenoid valves are extremely fast acting. The pilot valve closes in .270 second and opens in about .015 second.

A 3000 psi relief valve is normally set to open at 2500 psi.

• **Converter**—The cylinder converts oil pressure to water pressure. Water is pumped to the jet ring at the same rate oil is pumped into the converter. The workpiece is pushed through the jet ring by the movement of the converter piston. Oil pressure is enough to overcome exit resistance of the water,



PRESSURE SWITCHES allow operation only if oil level in reservoir is adequate and when air pressure is at least 70 psi.

packing and fluid friction, and the counter pressure of the air in the retraction cylinders.

• **Safety devices**—Pressure gages, one in the high pressure water line and one in the air line give visual checks. Two pressure switches give automatic protection. One is an oil level switch which opens to stop the pump motor if oil level in the reservoir should drop below pump suction inlet.

An air pressure switch is also in series with the motor starter. The pilot air valve requires 70 psi to unseat the poppet against maximum pump pressure. The air pressure switch will cut out the pump motor if air pressure drops below this safe working pressure.

A thermal switch, attached to the rear wall of the reservoir stops the motor if oil temperature exceeds 160 degrees.

• **Air retraction**—A pair of cylinders retract the converter. They are connected to a retracting yoke which engages the rear end of the converter plunger. A check valve in the retraction air line allows free flow of air from the cylinders to the plant air line during the work stroke. While retracting, an adjustable restricted air flow controls speed. This is necessary so that speed of retraction will not overrun the water supply which refills the converter. □ □ □

For a Fluid Power Contest Rules Booklet
Circle 240 on Time Saver Card

FOR PRESSURES UP TO 750 psig . . . . .

NEW Stainless Steel *Fulflo* FILTER

This rugged, compact filter is ideal for high pressure pneumatic and hydraulic applications. Maximum air flow rate is 650 SCFM at 750 psig with initial pressure loss of 3 psi. Flow rate for liquids of aqueous viscosity is up to 5 gpm, depending on nature of fluid, contaminant and operating conditions.

Patented 10-inch Honeycomb Filter Tubes provide true *depth* filtration through hundreds of filtering tunnels engineered for uniformity of size, shape and depth. Tubes are precision manufactured in a wide range of positively controlled densities to provide the exact degree of micro-clarity your operation requires — even down to 1 micron. Tubes are available in cotton, nylon, orlon, dynel, acetate and glass fibres.

Rugged one-piece shell is made from Type 316L stainless steel. All parts are of #316 stainless steel to minimize chemical reaction. Straight line pipe connections are ¾" NPT. Overall filter size is only 13 5/16" x 4 3/8".

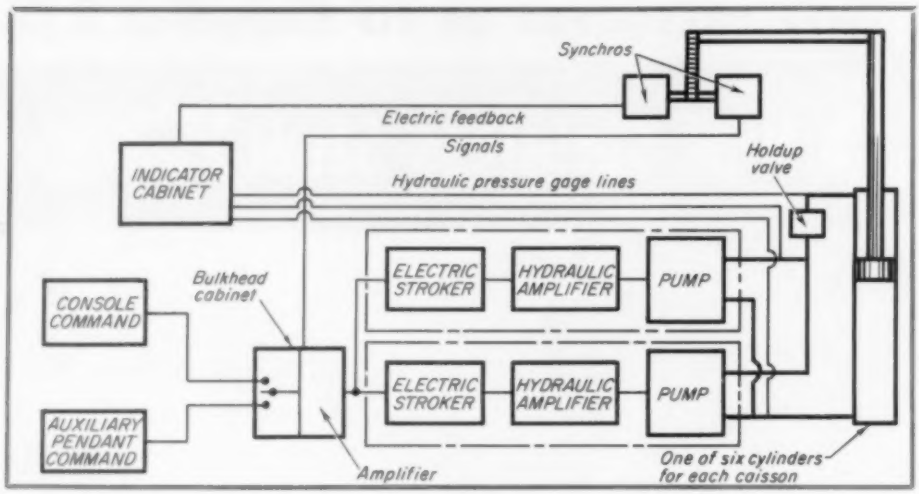
Write for Bulletin S600 to Dep't AH

COMMERCIAL FILTERS CORPORATION
MELROSE 76, MASSACHUSETTS
PLANTS IN MELROSE, MASSACHUSETTS AND LEBANON, INDIANA

MICRO-CLARITY AT MINIMUM COST

Fulflo FILTERS — *with genuine Honeycomb Filter Tubes for controlled micro-clarity of industrial fluids.*

CFC FILTERS — *Selective filtration of oils • water-oil separators • magnetic separators • pre-coat filters • coolant clarifiers • automatic tubular conveyors.*



POSITION is sensed by synchros which signal the servo pump to synchronize all four caissons.

Courtesy The Oilgear Company

OIL DRILLING

Servo pumps synchronize Mr. Gus

HOW DO you get a 6000 ton platform measuring 173 x 104 x 22½ ft to move up and down on four legs with a maximum tilt of 2 seconds of arc? Hydraulics is the obvious power source for this brute force job. Controlled hydraulics is the way to synchronize the movements.

Once the drilling barge is in position, a steel mat is lowered to the ocean floor. Four 10-ft diameter caissons extend upward 235 ft from the mat through openings in the platform. Six 20 inch diameter double acting cylinders around each caisson do the raising and lowering.

• **Jacking operation**—Each rod end is bolted to a circular yoke which surrounds the caisson. The yoke is guided on two rods and carries eight locking pins. They are moved in and out radially by air cylinders to engage corresponding reinforced holes in the caissons. These rings of holes in the caisson are spaced every 8 ft 2 in throughout the active height of the caisson. The platform structure carries another set of eight pins located between the jacking cylinders. Operating steps are:

1. extend rods to full stroke
2. engage the yoke pins in caisson

OFF-SHORE DRILLING BARGE uses hydraulics to put its four legs and steel mat into and out of the ocean floor. It weighs 9000 tons, costs more than $6.5 million. Bethlehem Steel built it for C. G. Glasscock Drilling Co.

THE LINK BETWEEN ELECTRONIC CONTROL AND HYDRAULIC POWER

Expert Welding Machine Co. Solves the High Production Contour Welding Problem With

VICKERS

Electro-Hydraulic Servo Valve

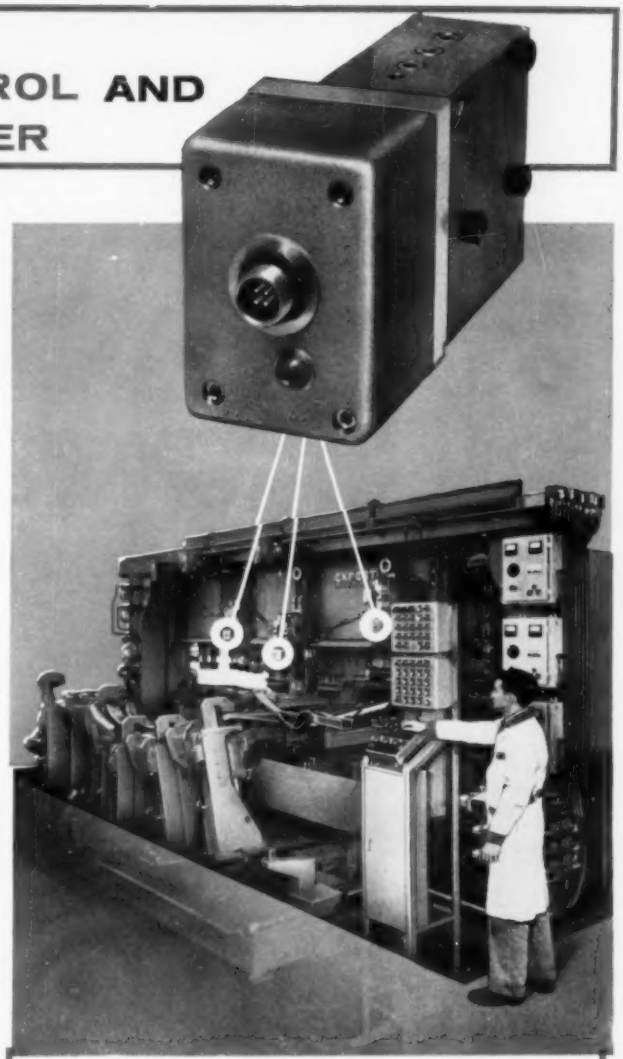
The versatility of electro-hydraulic control of power has solved one of industry's toughest problems — automatic welding of complex and contoured automotive frame members.

An electronic probe follows the weld line on the work and records any deviation from the path prescribed by a master cam. Any deviation from the governing cam contour creates an error signal which is amplified and fed to the servo valve. The servo valve converts these electrical signals into precise hydraulic flow to a cylinder which accurately positions the welding head allowing for variations in manufacturing operations . . . trimming, etc.

This application is only one of many in which Vickers Servo Valve has demonstrated exceptional performance under the exacting conditions of industrial production requirements.

Valve operation is simple. Reliability is assured—there are only four moving parts.

Investigate the production advantages offered by electro-hydraulics. **Write for Vickers Engineering Bulletin 58-74.**



EXPERT WELDING MACHINE COMPANY developed this automated welding machine that incorporates a magnetic-tape-tracer system. Vickers electro-hydraulic servo valve provides the link between electronic programming and hydraulic power. Vickers Pumps and Controls also used. The machine joins metal parts having untrimmed, out-of-tolerance, straight and/or contoured weld line edges.

Two U-shape channels are welded to form the box configuration in this complex automotive frame side member. Production is approximately 100 pcs/hr.

VICKERS INCORPORATED
DIVISION OF SPERRY RAND CORPORATION
Machinery Hydraulics Division

ADMINISTRATIVE and ENGINEERING CENTER
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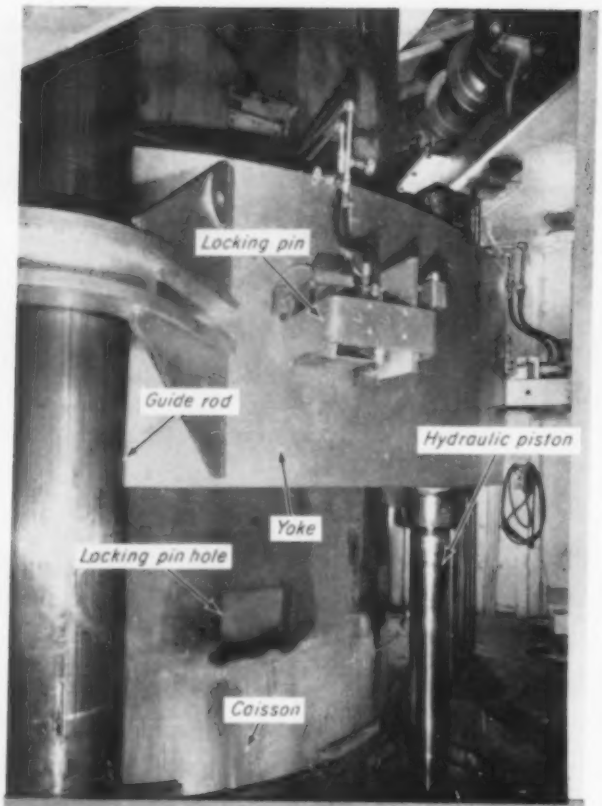
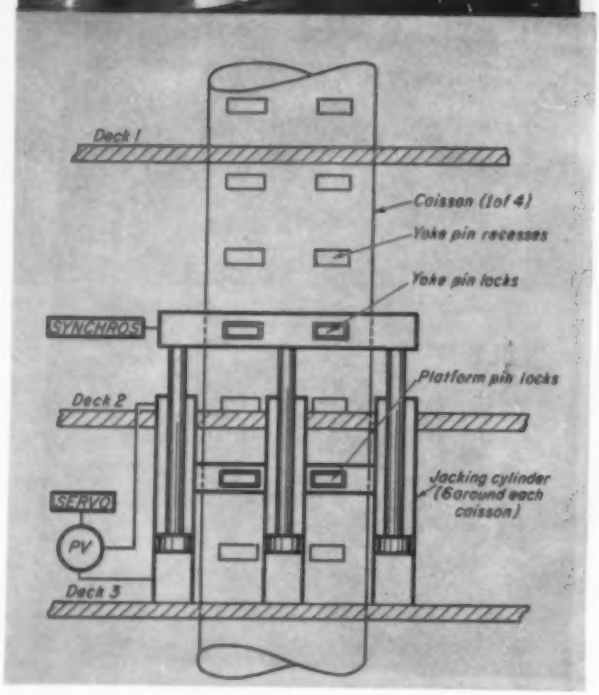
ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921





SIX JACK cylinders raise and lower each caisson. Piston rods are fastened to a reciprocating yoke. Cylinders are fixed to the platform. Alternately engaging and disengaging the yoke and platform pins results in caisson or platform travel as the pistons or cylinders reciprocate.

SERVO PUMPS SYNCHRONIZE

3. direct fluid power from the two pumps to the rod end of the six cylinders, pulling down on the caisson for a stroke of 8 ft 2 in
4. engage the platform pins to lock platform to caisson
5. retract the yoke pins
6. repeat step one.

• **Synchronizing**—The four hydraulic systems at the caissons operate independently. They are synchronized through the electro-hydraulic control to raise or lower the platform uniformly and accurately. Each system consists of two radial piston 2-way variable delivery pumps with integral auxiliary pumps, valves, and reservoirs. Normally, both pumps are used, but either can be used alone and the other isolated. Direction and speed of the caissons is controlled by the position and stroke of the slide-blocks in the pumps.

An electro-hydraulic servo system controls the eight pumps supplying power to the 24 cylinders around the edge of the four caissons. The control console, from which all the pumps may be controlled in unison, is in a central control room. At the control console each caisson may be operated separately. Separate stroking of each pumping station varies the amount of oil delivered to the cylinders to compensate for any discrepancy that may occur due to non-uniform loading of the platform.

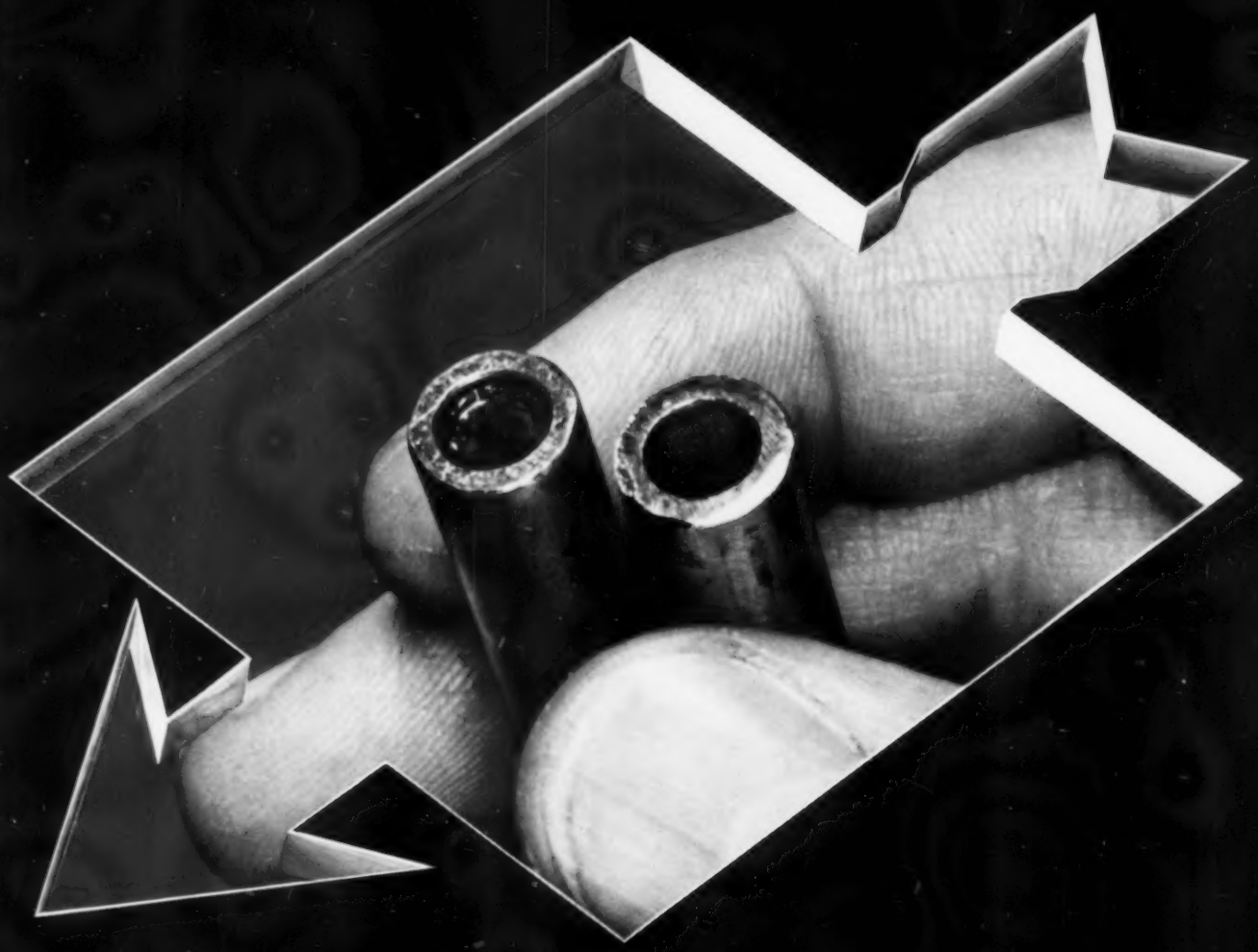
A power limiting control prevents overload of the electric motors driving the hydraulic pumps. This control decreases each pump stroke and volume of oil delivered when the horsepower demand exceeds a set value. Jacking speed is reduced proportionately.

A hand pendant control gives a way to control a pumping station from below or above deck wherever an electric control outlet is provided. This control is used for the windlass and all other auxiliary use for which the system is designed.

• **Servo control**—This semi-automatic jacking system is centered around the servo control in the pumps. This is an electro-hydraulic stroker which varies the oil delivery rate and changes the direction of flow from the pump in response to a low level electrical input signal. Each hydraulic pump is controlled by relaying the command signal to a 1/150-horsepower servo motor geared to the hydraulic force amplifier which controls the position of the slideblock in the pump. A few thousandths of a horsepower delivered by the servo motor is increased by the hydraulic amplifier to several fluid horsepower to actuate the slide block in the pump. Feed signals generated by synchros provide the synchronous control of position, velocity and acceleration. □□□

Circle 156 ➡

Quality–the best economy of all



Two oils...two lines...one clogged...one cleaned

A Sunvis 700 oil and a regular oil were run through two equally clogged hydraulic lines. The regular oil couldn't remove the sludge. The Sunvis 700 oil cleaned its line thoroughly. That's one job it's made for . . . to clean out sludge deposits in hydraulic lines while it transmits power.

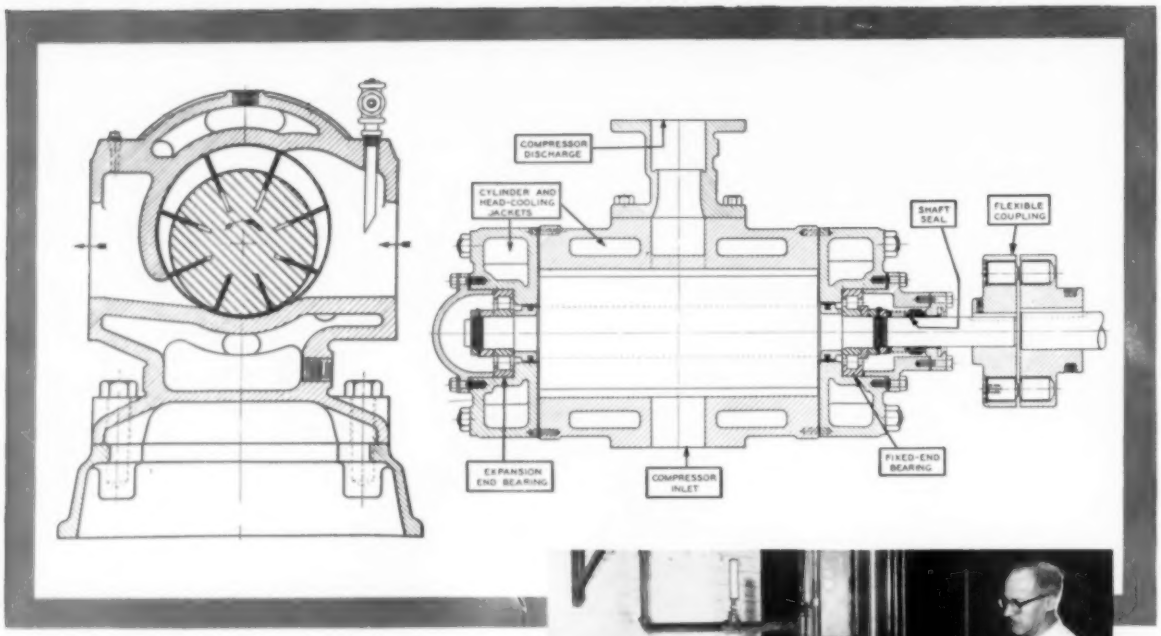
With a Sunvis 700 oil—like every Sunoco oil—you enjoy the best economy of all: the economy of quality. A Sunvis 700 oil lasts longer. The machinery it protects lasts longer. It prevents rust . . . ups output by reducing downtime.

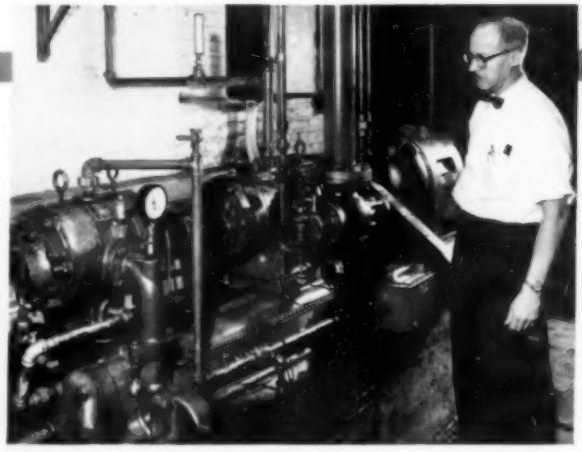
FREE Trouble-Shooting Chart will help you spot and cure common hydraulic system troubles. For your copy, write to:

Sun Oil Company, Philadelphia 3, Pa., Department I-12.

MAKERS OF FAMOUS CUSTOM-BLENDED BLUE SUNOCO GASOLINES

SUNOCO®





Hard service never affected this Fuller rotary's original output—230 cfm. of air at 90 lb. G., reports Mr. Schott, chief engineer, Thomas C. Wilson, Inc., Long Island City, N.Y.

FULLER ROTARY COMPRESSOR RUNS 13 YEARS WITHOUT DOWNTIME

A Fuller rotary at Thomas C. Wilson, Inc. got its first maintenance shutdown recently, for renewal of roller bearings and rotor vanes—after running without downtime since 1945.

4 years of 24-hour service. The Wilson plant makes tube cleaning equipment, tube expanders and portable pneumatic tools, and so makes heavy daily demands on shop air. For the first four years, three-shift operation kept the Fuller rotary running round the clock. Since 1949, it's been working eight-hour shifts.

Simple design means trouble-free service. Besides bearings, the only moving parts in a Fuller vane-type rotary compressor are the cylinderical rotor and the blades. These compensate for wear automatically. Cylinder head slips off, permitting blade and bearing inspection in a matter of minutes.

Compact and vibration-free. Direct-drive system saves space. Simple, rugged design gives constant service without extensive supervision. Thus, Fuller rotaries can be installed out-of-the-way—on upper floor, on balconies, in basement corners, using low-cost, light-weight foundations.

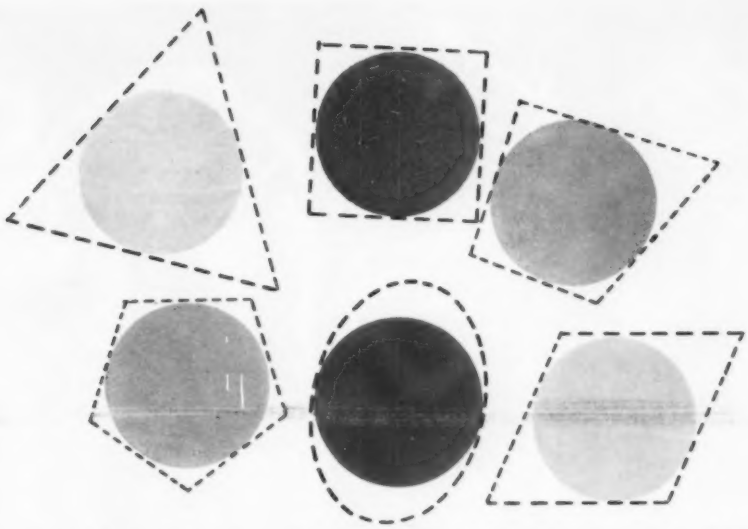
1189
C-340

Write today for detailed information on the full line of Fuller rotary compressors for in-plant services, gas gathering, and industrial refrigeration.

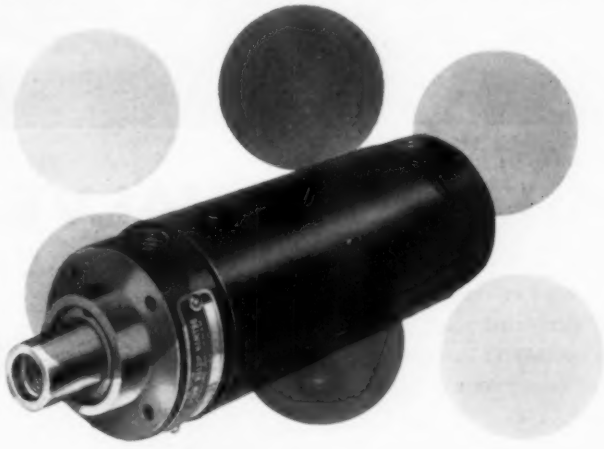
FULLER COMPANY
142 Bridge St., Catasauqua, Pa.
SUBSIDIARY OF GENERAL AMERICAN TRANSPORTATION CORPORATION
Birmingham • Chicago • Kansas City • Los Angeles • New York • San Francisco • Seattle

Fuller
....pioneers in harnessing AIR

PIONEERS OF HIGH-EFFICIENCY VANE TYPE ROTARY COMPRESSORS SINCE 1930



Air 150 psi
Hydraulic up to 1500 psi
Meet JIC Standards
Series 101A



O-M Cylinders Fit Where Others Won't

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ORIFICES	1/16" THROUGH 3/16"	1/8" AND 3/16"
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PRINTING

Accuracy and low maintenance put hydraulics on linotype

• By WILLIAM B. ABBOTT, *Section Engineer, Research & Engineering Div. Mergenthaler Linotype Co., Brooklyn, N.Y.*

WHAT problems does the designer ot printing machinery face when selecting hydraulics? He designs machines for an industry where mechanical complexity is standard. It might even be considered a measure for precision. His customer has the know-how to maintain and adjust these mechanical wonders. But many users have a limited understanding of hydraulics. For buyers to accept any hydraulic device it must offer real benefits and be free from operating and maintenance headaches.

Figure 1 shows the hydraulic circuit and mechanism developed by Mergenthaler Linotype Company. This arrangement replaces a full mechanical system for setting quadded lines. In casting type on a Linotype machine, a device is needed to set short lines of type either in the center of a column or at either end of the type slug. These are quadded lines. Mergenthaler calls it the Hydraquadder. By automatic and accurate movement of the matrices inwhich type is cast there is no need to fill out the line with blank matrices.

• **Automatic jaw movement**—The hydraulic system has a pump that is belt driven from the machine motor, a control valve that is timed and operated by a cam, a selector valve, and two double acting

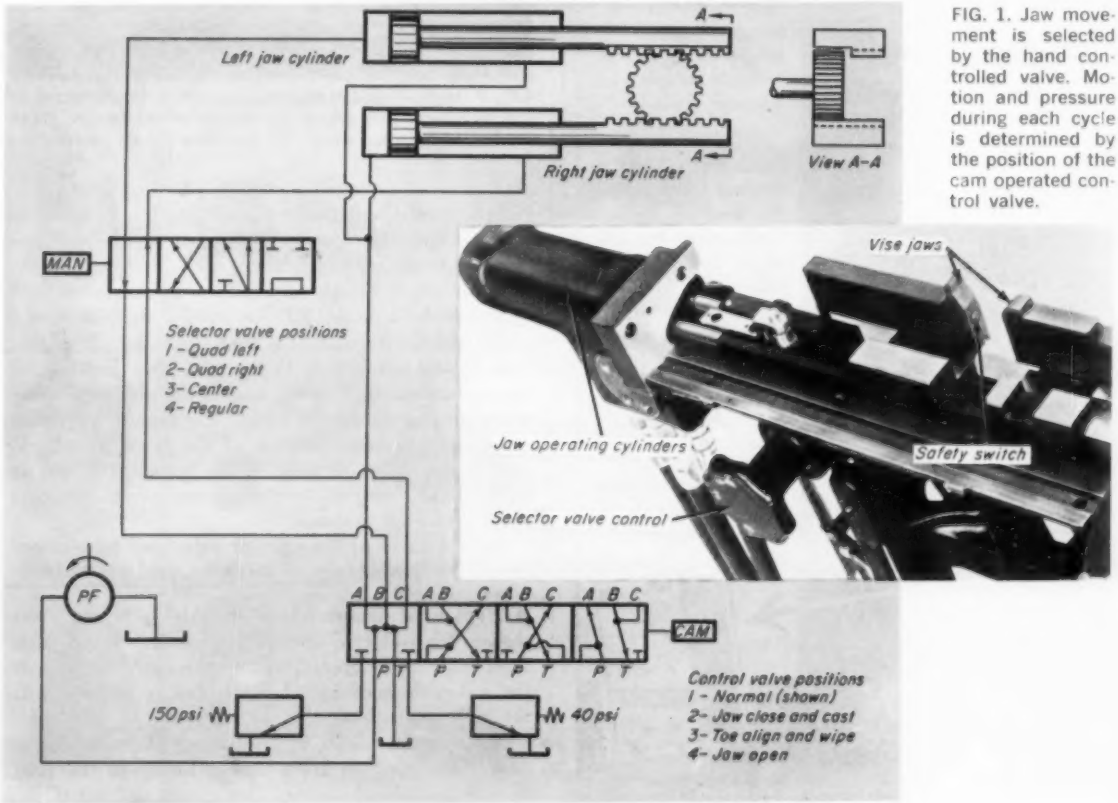

FIG. 1. Jaw movement is selected by the hand controlled valve. Motion and pressure during each cycle is determined by the position of the cam operated control valve.

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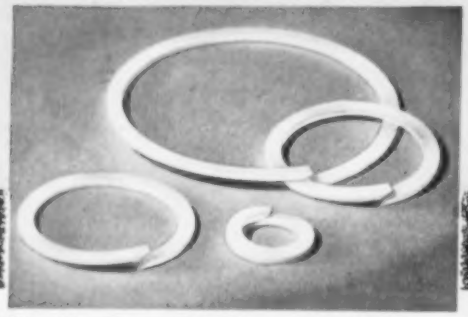

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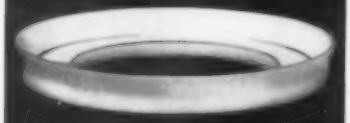
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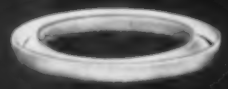
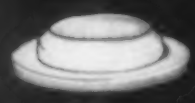

Style 614 V Rings

Style 410 U Cups and Blocked Vees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cylinders. Jaws, holding the type matrices, are moved separately by the cylinders.

The control valve is a packed plunger design. It has four operating positions. They are noted on the drawing. Two pressures are needed during each cycle. The 150 psi is for closing and casting; the 40 psi is for toe alignment (vertical alignment before casting) and to develop a wiping action between the end matrices and the jaw faces. The wiping prevents build up of type metal as the matrices are lifted out of the jaws.

HOW JAW MOVEMENT IS SELECTED

Selection of cylinder operation is made with the selector valve. In "quad left" position, oil pressure against the rod end of the right jaw cylinder forces this jaw to the left. Oil out of the blank end of the

FIG. 2. Hydraquadder assembly at left is independent of machine functions except for timing of operations. Hand control of selector valve can be replaced by pushbutton or tape.

right cylinder and both ends of the left cylinder is open to tank. In "quad right" position, the left jaw cylinder is moved to the right.

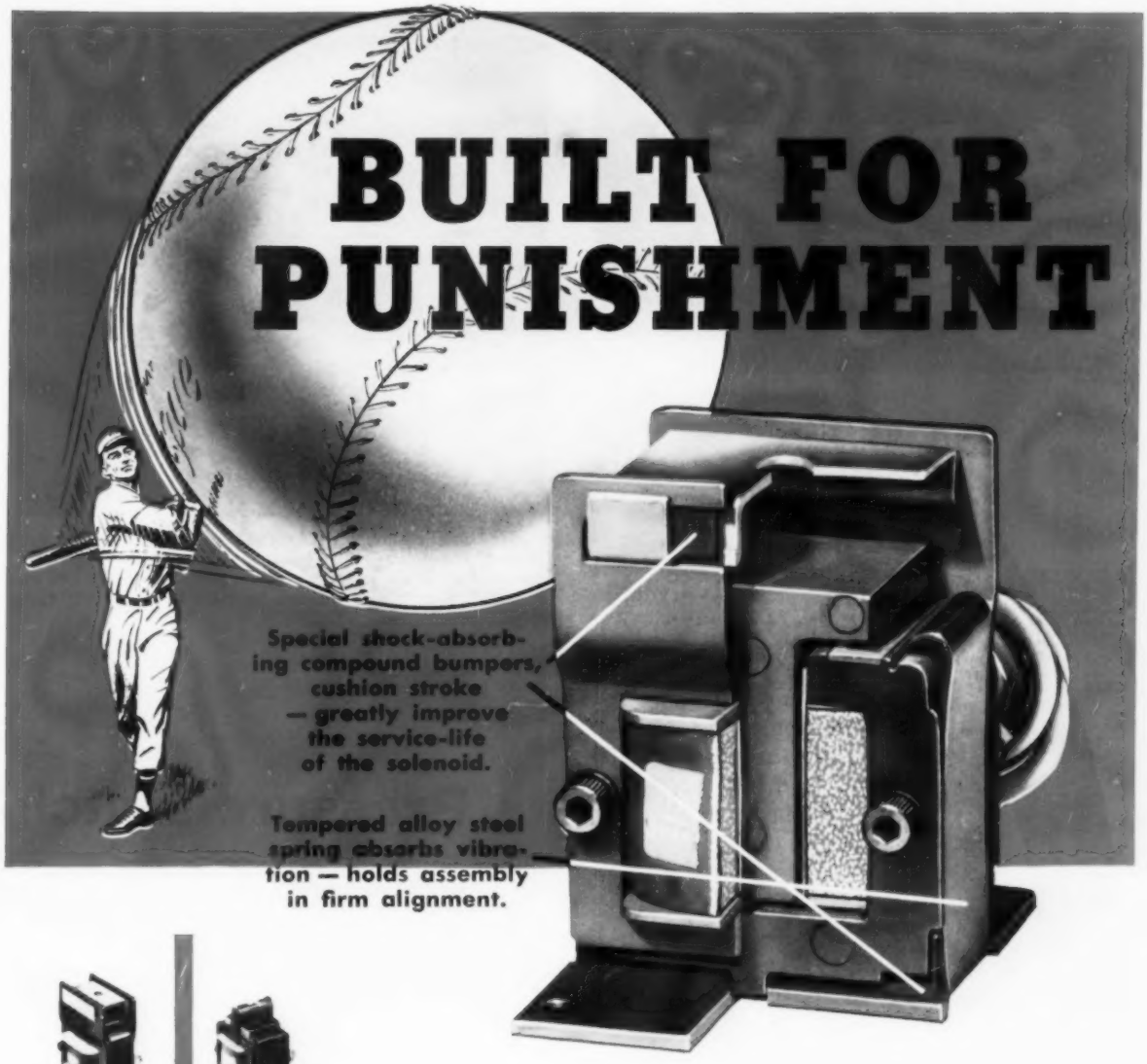
"Centering" brings in another mechanism. Both cylinders must move. To synchronize their motion a small pinion moves in to mesh with the racks that connect the piston rods to the vise jaws. Putting the selector handle in "center" causes the pinion to move downward to engage the racks. The pinion is an idler which insures equal motion of the jaws. Any backlash in the pinion or wear in the linkage is taken up in the same direction by the pistons which are being acted on by oil pressure.

Hand control of the selector valve can be replaced by electric pushbutton or a tape control.

• **Packaged design**—Low operating pressure is one reason for leak-free operation. Another is the packaged design. The control valve is mounted directly on the reservoir and the selector valve is integral with the cylinder housing.

An electric switch in left jaw prevents the type cast if the matrices are not held firmly in the jaws. □□□

BUILT FOR PUNISHMENT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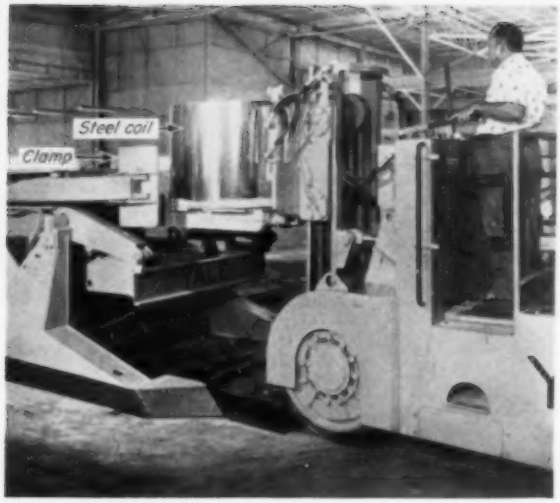


STEEL COIL mounted on a pallet is placed on the platform of the unloader. Three, cylinder-operated clamps close on the coil. When pressure to the cylinders reaches 450 psi, it actuates a pressure switch to start the upending cycle.

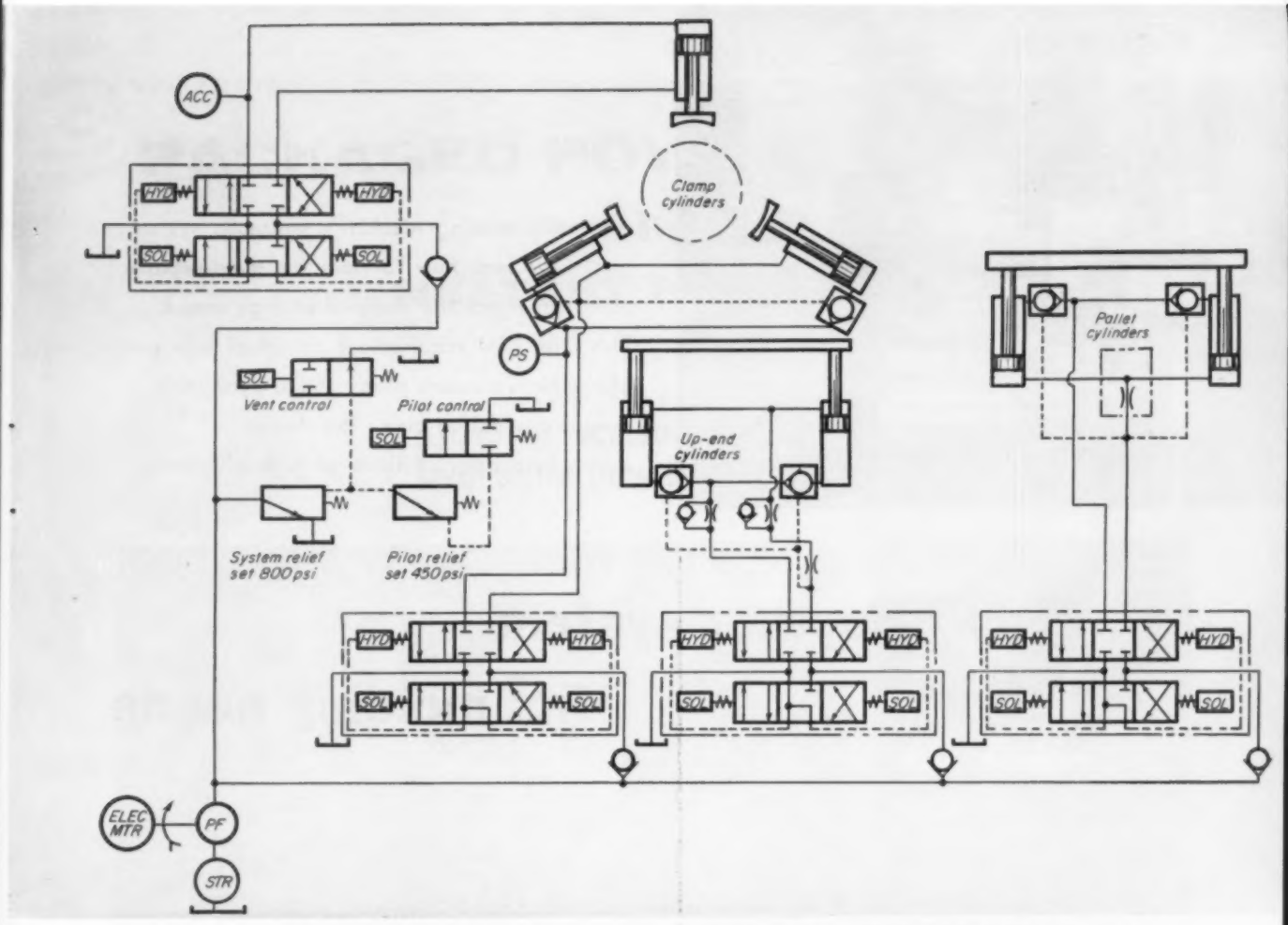
MATERIAL HANDLING

Pressure switch selects system pressure

• By ALBERT PURE,
Assistant Chief Engineer—Attachments
Yale Materials Handling Division,
The Yale & Towne Mfg. Co., Philadelphia, Pa.

HERE'S a circuit that uses a pressure switch to perform two functions. It sequences cylinders and it selects circuit operating pressure. Pressures under 450 psi are required for clamping to prevent coil damage, while 800 psi is required for upending the load.

Sheet metal coils are placed upright on pallets for shipment, but they must be turned sideways to load them into fabricating machines. To do this job, Yale & Towne developed a floor-mounted hydraulic up-ender for 10 ton coils. A lift truck equipped with a hydraulically operated split ram removes the coil from the up-ender. □ □ □



BETWEEN CYCLES the pilot connection of the pressure regulator is vented to tank and the main flow from the pump is directed back to the tank. When a coil of steel is placed on the platform, the lift truck operator pushes and holds a **start** button. This energizes the pilot control valve, and the vent control valve solenoids. With these energized, the system pressure is limited to 450 psi through a secondary pressure regulator.

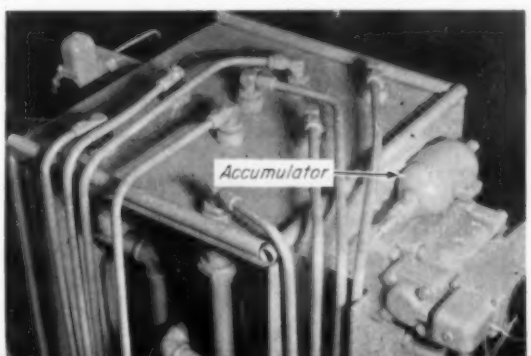
When the clamp pads reach the coil, pressure builds up to 450 psi and actuates the pressure switch. Closing the contacts on the pressure switch diverts the flow from the clamp cylinders to the upend cylinders. The clamp cylinders are now locked in position and an accumulator in the clamp circuit makes up any leakage.

The pressure switch also de-energizes the pilot control valve solenoid. This takes the secondary pressure regulator out of the circuit. Pressure can then increase to 800 psi which is the setting of the system relief valve. While 800 psi is being used to upend the coil, the clamp circuit is locked in at 450 psi.

When the coil reaches the horizontal position, a limit switch releases the top clamp cylinder and extends the pallet-removing cylinders. When the pallet is clear of the coil, a limit switch stops the cycle.

FORK TRUCK operator holds start button on the pendant until coil is in the upended position shown. Pallet cylinders then move the pallet away from the coil. When the pallet clears, a limit switch stops the cycle. After the coil is removed, the operator depresses a push button to return the machine to its starting position.

ACCUMULATOR IN the clamp circuit assures that valve or cylinder leakage will not let the clamp arms loosen during rotation. It has a 1 qt. capacity and is precharged to 250 psi. Pilot check valves lock arms in cradle position.



A plastic molding machine's hydraulic system must have high flow to close the mold rapidly and then inject the material at high speed. This high flow requirement continues into part of the high pressure phase of the cycle, then flow drops during cure. The design shown here does all three at high efficiency.

PLASTICS

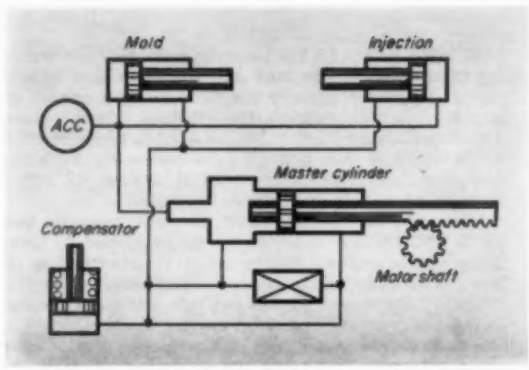
Booster system fits molding needs

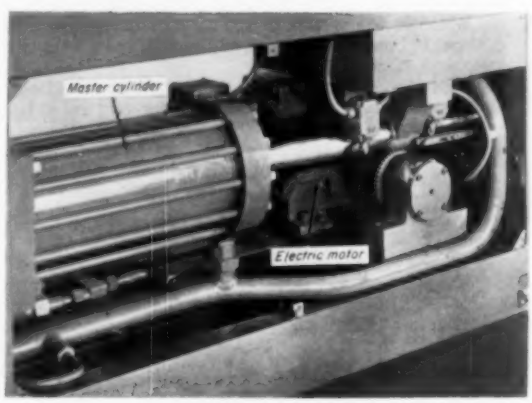
• By ISLYN THOMAS, *General Manager, Newark Die Co., Newark, N.J.*

PLASTIC MOLDING of thin section parts requires high speed injection of the hot melt, so that the material fills the mold before cooling. Because of pressure drop in the heating element, pressure at the injection nozzle is only about half of that at the injection plunger. Therefore the requirement of high pressure in the injection cylinder combines with the need for high flow for fast speed. After injection, a dwell allows the material to cool and form the part. The hydraulic requirement during this part of the cycle is no flow (except to make up any leakage) and high pressure. A typical machine must pump about 20 gpm to make a 5-oz shot in two seconds.

• **Pump systems**—A constant delivery pump powering the system must dump high pressure oil over a

Continued on page 110





SINGLE INJECTION CYLINDER, SINGLE STROKE MACHINE has ¾-oz capacity. Adjustable piston extension on spring-loaded accumulator actuates limit switch to stop motor and limit high pressure. Later models use bladder type accumulator and pressure switch.

MASTER CYLINDER GIVES HIGH FLOW, then high pressure when piston projection enters small diameter. Enlarged cylinder diameter permits escape of low pressure fluid around piston.

SPECIAL ELECTRIC MOTOR drives master cylinder through reduction gearing. Welded construction of piping simplifies installation, reduces leakage points.

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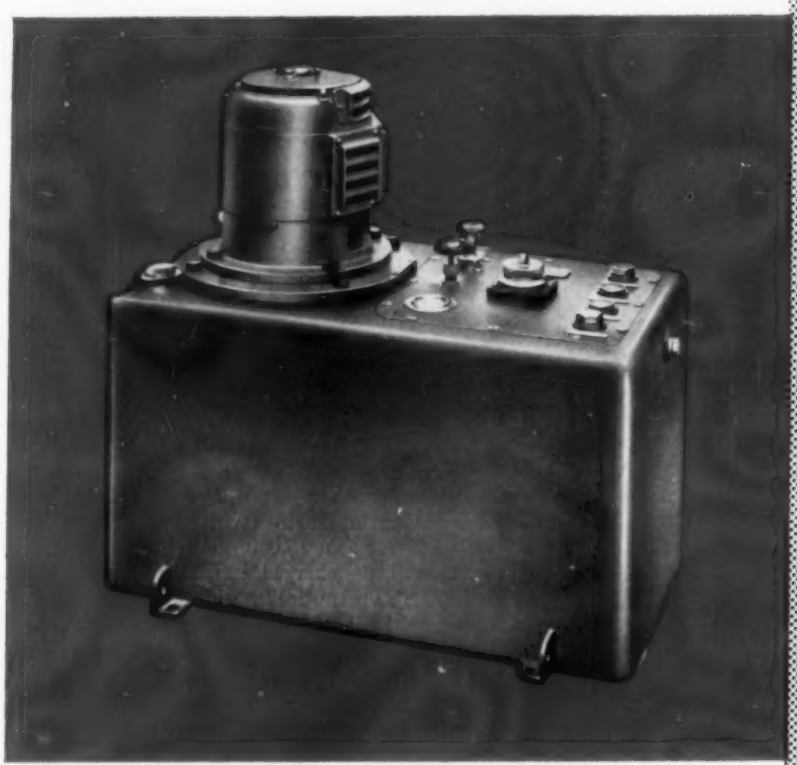

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For complete data write for catalog S-10000.

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Circle **18** *on Time-Saver Card*

relief valve during the dwell period. This wasted energy heats the oil and usually requires a heat exchanger. Pressure-compensated, variable delivery pumps meet the high flow, low pressure/low flow, high pressure requirements very well, but do not supply high flow at high pressure.

A third way of keeping pump capacity at a minimum is to use an accumulator. Where the operation involves many molding machines, a central pump-accumulator system works well. However, an individual hydraulic system integral with the machine has advantages of flexibility in locating machines and in changing its cycle. Also this concept makes the manufacturer of the machine responsible for its performance characteristics, without the influence of a central system design.

● **Booster system**—The system developed at Newark Die to fit these exact requirements uses a combination master cylinder and booster driven by a special electric motor. A rack, cut in the master cylinder's piston rod extension, meshes with a gear driven by the motor which is designed for intermittent, reversing operation with very fast starts and stops.

Motor size is about 4 hp per oz. of machine capacity. As the motor rotates counter-clockwise, it forces the piston to the left delivering fluid to the MOLD and INJECTION cylinders at about 210 psi. When the piston enters the large diameter section of the master cylinder, the projection enters the small diameter section of the cylinder. Further travel of the piston raises the pressure for clamping the mold and injecting the material. Limit switches control stroke of the piston and maximum pressure in the system. If the mold does not close completely, a safety switch stops the motor before the high pressure part of the cycle. About 2000 psi is developed in the high pressure phase of the cycle. This gives about 15,000 psi on the material.

During dwell, the charged accumulator holds pressure by making up any leakage in the system. At the end of timed dwell, the motor reverses, driving the piston to the right and retracting the MOLD and INJECTION cylinders.

Fluid for the system is a thin, hydraulic oil or water mixed with a lubricant. Because there are no high speed pump parts or valves, lubricity and filtration are not problems.

The globe valve between ports of the master cylinder is normally closed. Opening the valve allows flow from the spring-loaded compensator to the right side of the master cylinder, making up any differences in volumes over long periods of time. The light compensator spring exerts just enough force to overcome friction. □□□

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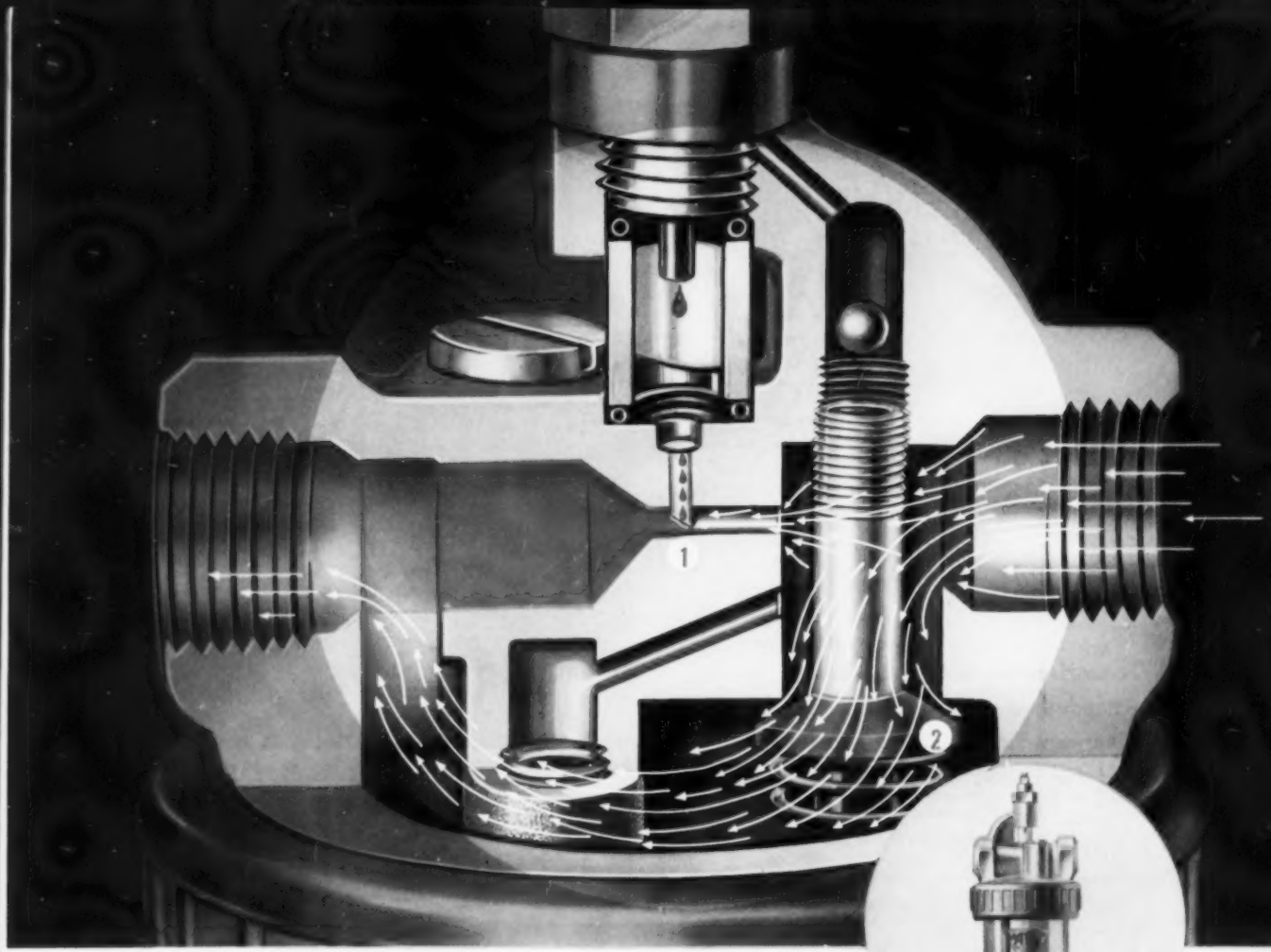

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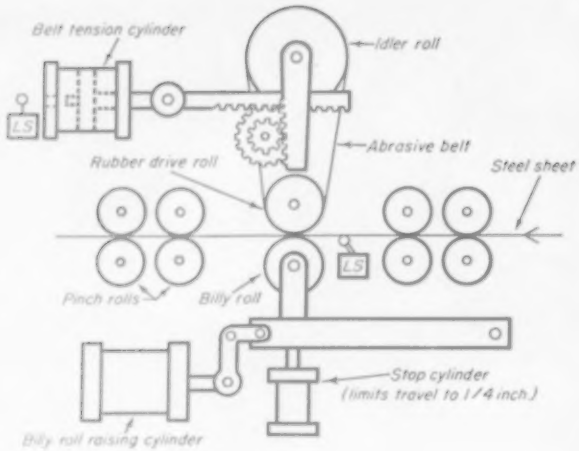
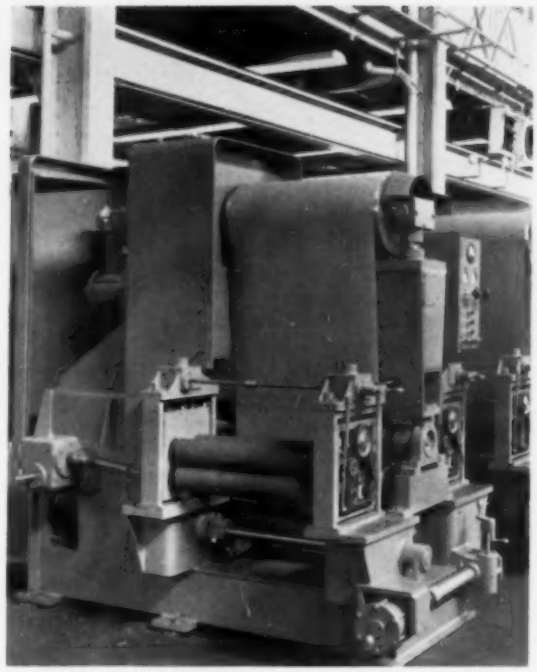


When extremely short time delays are needed, electronic timers may be the answer. Timers in this circuit can be set for delays as short as .025 seconds.



BELT GRINDING MACHINE for sheet metal. Power driven pinch rolls feed the sheet through the machine. Air cylinders maintain proper belt tension. They also raise and lower a billy roll which keeps the sheet pressed against the belt.

METAL FINISH

Timed pneumatic system improves

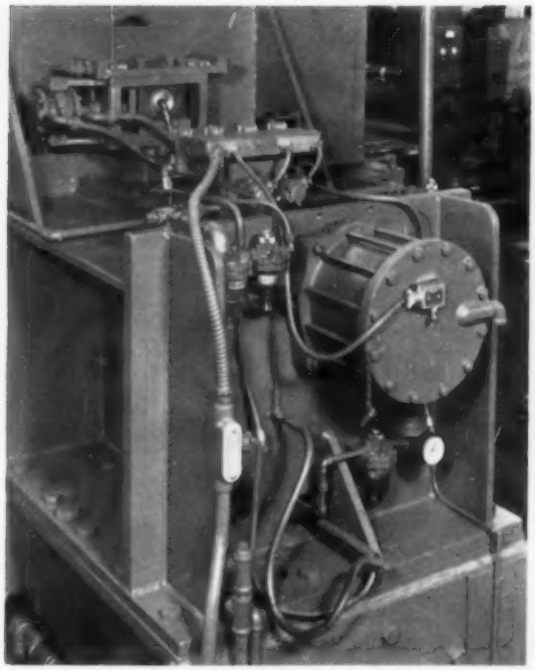
• By EDWARD MOLDOVAN, *The Hill Acme Company, Cleveland, Ohio*

ABRASIVE belt grinding steel or aluminum sheet gives a decorative satin or mirror finish. But if the leading edge of the sheet hits the belt, it knocks off abrasive and gives a wavey pattern. The solution worked out at Hill Acme is to force the sheet against the abrasive belt *after* the edge has passed under. Close timing of an air cylinder gives this action.

A limit switch, actuated by the leading edge of the strip, starts an electronic timer. When this times out, after the leading edge passes under the abrasive belt, it actuates the cylinder which raises the billy roll. When the trailing edge runs off the limit switch, a second timer starts. It times out to drop the billy roll as the trailing edge of the sheet approaches the abrasive belt. Thus the belt is protected from hitting either end of the strip.

• **Timer Operation**—Electronic timers are used because of the short time delay required. A delay as short as .025 sec, with accuracy of ±2% can be set on the timers. They use a thyratron tube as a combination a-c rectifier and electronic switch. Time delay is determined by the time required for a resistor-capacitor in the grid control circuit of the thyratron to discharge from an adjustable initial voltage to a fixed final voltage. The thyratron tube will not conduct current unless its control grid voltage is more positive than —2 volts. The capacitor places a negative voltage, greater than the critical value, across the control grid of the thyratron. When the timer starts, the resistor-capacitor begins to discharge. When the negative capacitor voltage reduces to the critical value, the thyratron tube conducts. A relay, in series with the tube, closes when the tube conducts.

• **Electrical Safety Feature** — The abrasive belt travels around a rubber drive roll and an idler roll. A single-acting air cylinder, connected through a rack and pinion to the idler roll, keeps proper tension on the belt. The belt is in tension with pressure on the



BELT TENSION CYLINDER is front-flange mounted. A limit switch mounted on the blind end is actuated by a pin attached to the piston. When the piston rod moves, the pin passes through a hole in the end cap and trips the limit switch.

ground finish

rod end of the cylinder. This cylinder has an unusual feature. A pin is connected to the blind end of the piston. If the belt breaks, the piston being under pressure completes its stroke. When the piston reaches the blind end cap, the pin extends through a hole in the cap and actuates a limit switch. The switch cuts off all power and applies the brakes. When the power goes off, a solenoid, 3-way valve controlling the single acting billy roll cylinder, shifts. Weight of the billy roll and its supporting members causes it to drop away from the work. The broken belt can then pass through without damaging the work.

Full travel of the billy roll is 1¼ in. However, it is not necessary to drop the roll that far to let the edge of the strip pass. Two small air cylinders are extended to limit billy roll travel. They allow it to drop only ¼ in., when the leading and trailing edge of the strip pass under the belt. If the belt breaks, these cylinders retract and allow the full 1¼ in. for the broken belt to pass through. □□□

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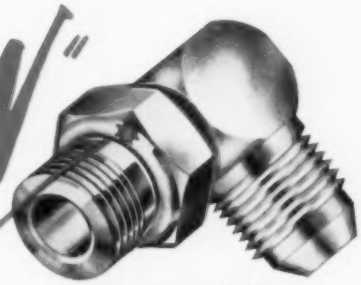

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- Assemble and reassemble without damage to port or fitting—assures positive seal.
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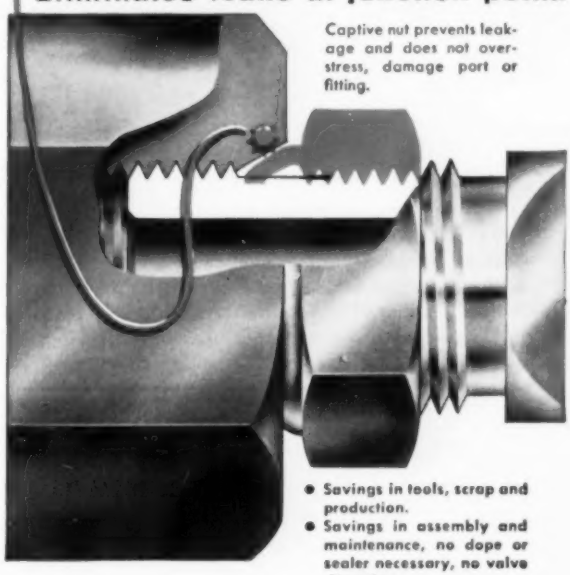
Captive nut prevents leakage and does not overstress, damage port or fitting.



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- Savings in assembly and maintenance, no dope or sealer necessary, no valve distortion.

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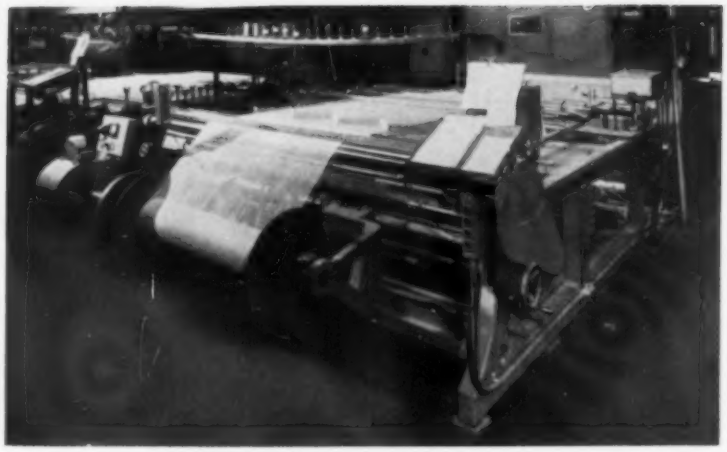
Textile machines require precise tension and speed control to insure a uniform product. A variable displacement pump and motor in a simple circuit provide a precise control.



TEXTILE

Speed and tension control displacement pump and

WHEN a broad ribbon of textile fibers is wound on a beam, yarn tension must be held constant as the beam rotational speed changes with the diameter of the winding. This occurs at the slasher, prior to the loom (weaving) operation. Any deviation in yarn tension can be quite serious when the fibers are being woven. The slasher drive operates the winding function. This variable torque hydraulic system meets the following requirements:

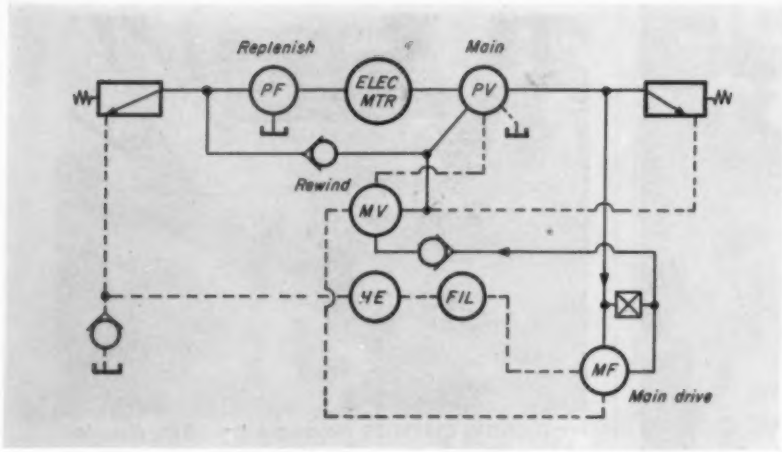
1. Operating horsepower proportional to the linear speed and tension of the yarn.
2. Tension control as beam diameter changes, regardless of speed variations.
3. Initial torque steplessly variable. These problems are basically the same in paper and printing machines where web winding is the primary duty.

A constant speed, double end, textile type electric motor drives two pumps: the variable delivery, main drive pump and a constant delivery, replenishing pump. Fluid in the closed circuit flows through the main drive hydraulic motor, the rewind motor, and back to the variable delivery pump. Because the two motors are in series, they are always synchronized.

The main drive motor governs the slasher speed in proportion to variable delivery pump output. The rewind motor drives the beam. Its speed and torque are controlled by a pressure compensator that reacts

Advantages of Hydraulic Slasher Drive

1. Better tension control and adjustment.
2. Infinitely variable running speeds.
3. Independently adjustable acceleration and deceleration.
4. Selective creep speeds.
5. Responsive speed control.
6. Reduced operating costs.



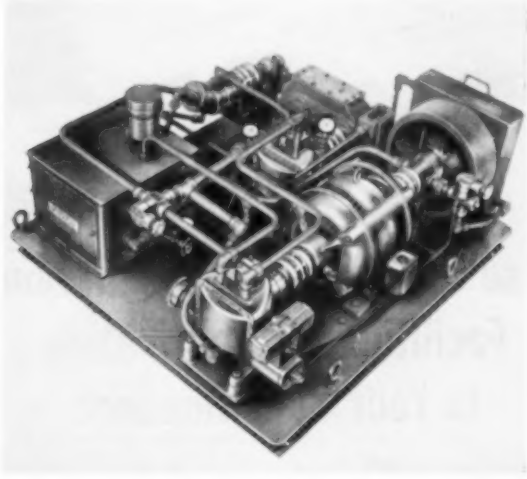
Courtesy Vickers, Inc.

TEXTILE SLASHER INSTALLED shows relation of machine to the yarn rewind beam. Chain drives convey power to the driven units.

TWO FLUID MOTORS, one fixed—the other variable delivery comprise the prime movers of this circuit. Their coordination results in an efficient winder speed and tension control.

COMPACT POWER PACKAGE for ease of installation and maintenance. Variable delivery pump (in foreground) uses cylinder controlled by solenoid valve for displacement control.

with variable motor system



to changes in system pressures. This compensation keeps pressure constant by changing motor displacement to meet increasing torque requirement as yarn builds up. At the same time, increased displacement decreases speed proportionally.

Yarn tension adjustment is obtained by setting the pressure on the pressure compensator. Constant yarn tension is maintained, once adjusted.

Three secondary circuits originate from the constant delivery pump. A replenishing circuit makes up small leakage losses in the main circuit. A pilot pressure circuit controls the variable delivery pump. Surplus fluid from the constant delivery pump flows through a heat exchanger, then through the cases of the motors and main drive pump for lubrication and cooling.

• **Speed Control**—Variable delivery pump displacement is remotely controlled by push-button stations wired to a 4-way solenoid valve. This controls a double-acting cylinder in the pump. When one solenoid is energized, oil (from a built-in pilot system) actuates the cylinder, which increases pump displacement. The slasher speed increases proportionately. To decrease slasher speed, the other solenoid is energized, causing the cylinder to move the pump in the reverse direction. When the two solenoids are de-energized, the pump is blocked in its existing angular position and the speed remains constant.

Yarn linear speed required for any given winding application may be set at the time the drive is installed by adjusting and locking the pump displacement.

An optional speed control feature changes pump displacement according to moisture conditions. A fractional horsepower electric motor-reducer drive positions the stop, limiting maximum pump displacement.

In a textile mill, lint contamination of fluids and lubricants is a constant problem. For this reason, the hydraulic system is closed and the component bearings are lubricated by the system fluid.

This hydraulic solution to the textile winder drive problem resulted in increased response in speed and tension control, as well as greater reliability at a reduction in operating cost. □□□

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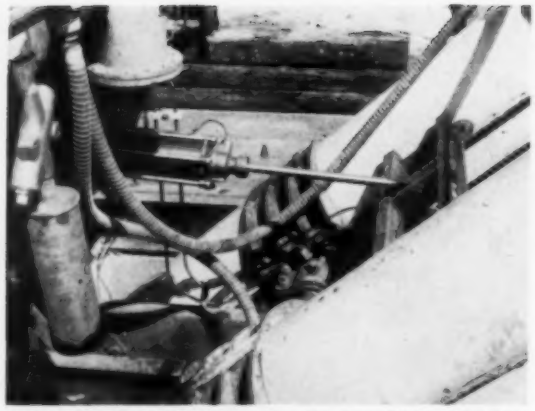


POSITIONING CYLINDER moves the two 20-in. diameter tilt cylinders into place. The tilt cylinders move together and are trunnion-mounted for easier movement by the positioning cylinder.

RAILROAD

Fine control

• By JOHN W. HISLOP, *Technical*

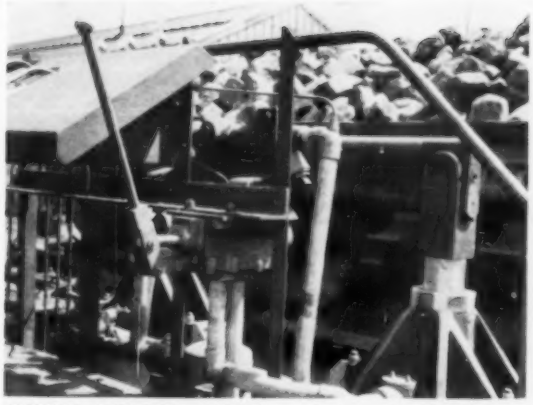
REGULATING air pressure on both sides of the tilting cylinders gives this air system fine control under high load. A manual valve, with linear flow-displacement characteristics meters rod end exhaust.

Tipping a railroad car loaded with 25 tons of copper ore seems like a natural for hydraulics. However when Lang Pneumatic Ltd. designed a car unloader for an African copper mine, they selected pneumatics. They did so because the mine had an ample supply of compressed air and their men were trained in servicing air-operated equipment.

Two, 20-in. diameter air cylinders tip the car body over to unload the ore. The body is returned to its upright position by retracting the cylinders. An air cylinder clamps the car chassis to the tracks while the body is tipped. Another air cylinder positions the large tilting cylinders in brackets on the side of the car body.

The manual 4-way valves that extend and retract the clamping and positioning cylinders are mechanically interlocked. This makes sure that the chassis is clamped to the tracks before the tilt cylinders move into position. A sequence valve directs air to the pilot of a normally-closed shut-off valve in the line to the blank end of the tilt cylinders. This valve assures that the tilt cylinders are in place before they can be extended.

• **Tilting**—A pressure regulating valve maintains 40 psi on the blank end of the tilt cylinders. A manu-



MANUAL CONTROL VALVE for operating the tilt cylinders has a 2-foot, spring loaded lever for accurate control. Valve is designed so that air flow is directly proportional to spool travel.

TILT CYLINDERS have a stroke of 6 ft. 10 in. and are made from 20-in. diameter seamless, drawn copper tubing. They weigh over 3 tons each.

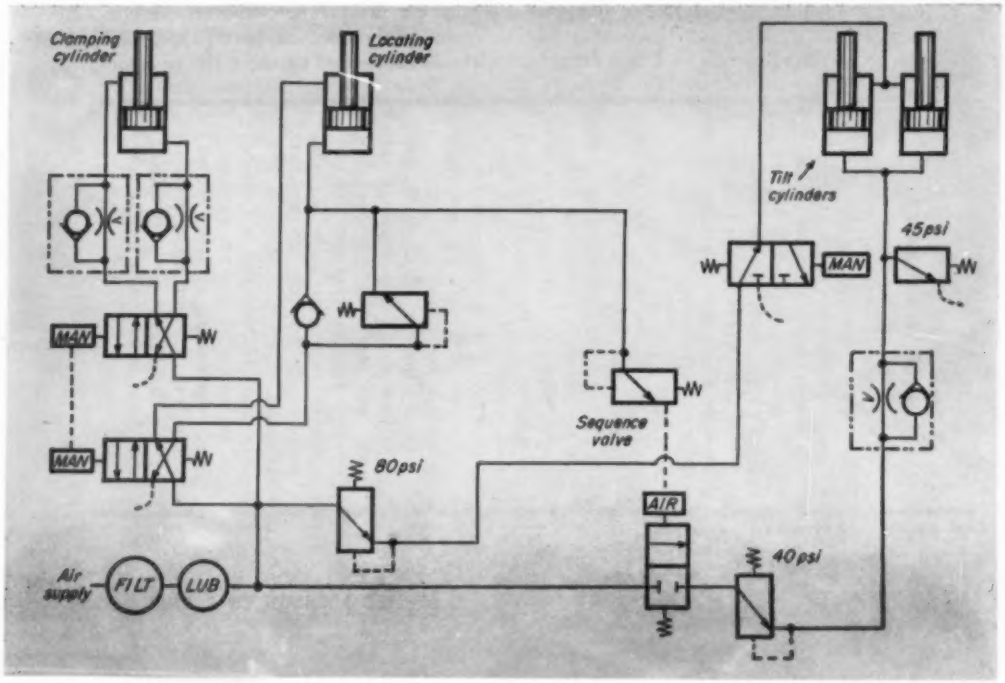
# of air cylinders to tip ore car

Liaison Officer, Lang Pneumatic Ltd., Wolverhampton, England

ally-operated 3-way valve directs 80-psi air to the rod end. This valve is spring loaded to the open position. To ttilt the car, the valve operating lever is actuated. This bleeds air from the rod end of the cylinders, proportional to the movement of the lever. As pressure in the rod end drops, the 40-psi in the blank end extends the cylinder.

It is not necessary to completely exhaust the rod end. Some residual pressure helps cushion the movement and won't let the load take charge and tip too fast.

Releasing the valve lever directs 80 psi to the rod end, and the cylinders retract. Air trapped in the blank end escapes through a pressure relief valve set at 45 psi. □□□



SEQUENCE VALVE prevents operating the tilt cylinders until the locating cylinder is extended. Tilt cylinders extend by exhausting air from the rod ends. Pressure on both sides of the pistons assure accurate stroke control.

MINING

Protected package design assures safety

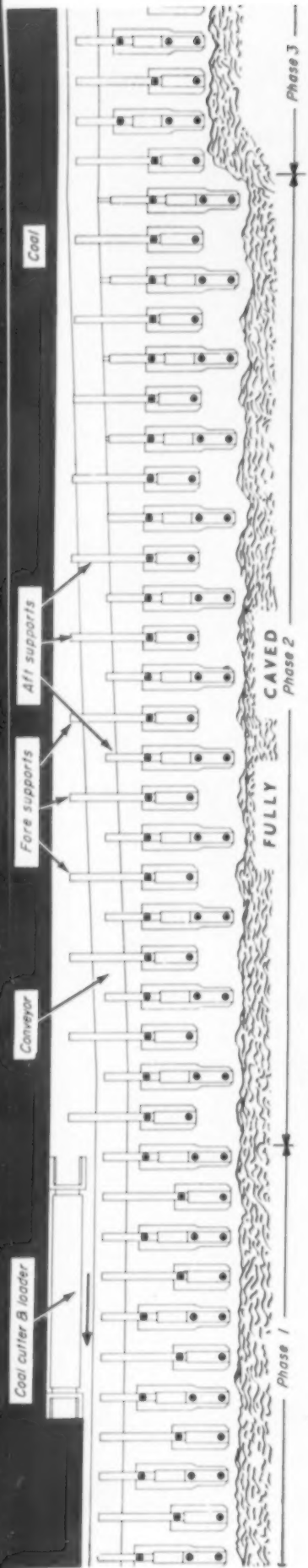
• By R. CURZON-HOPE
Dowty Mining Equipment, Ltd., Tewkesbury, England

Safety is important when selecting components for a coal mine hydraulic system. It must be designed so that failure of one component won't effect operation of the rest of the system. Flexible hose lines must be kept to a minimum, since they can be punctured by moving equipment or falling coal.

IN LONGWALL coal mining as many as 200 hydraulic props support the mine roof and move the coal conveyor. A coal cutter, traveling the length of the conveyor, digs out coal and dumps it on the conveyor. As the cutter moves along, roof supports close in behind it. Cylinders, connecting the conveyor to the supports, push the conveyor over to the coal wall, in place for the next pass of the coal cutter.

• **Pressure Piping**—There are only two main flexible hose lines running through the face of the mine. One is for supply and the other return. They are both made of double wire braid hose. Great care was taken to prevent damage to these lines. They are shrouded with steel angle plate and attached rigidly to the side of the conveyor. To prevent back pressure during prop closure, a 1¼ in. diameter line is used for return, even though the pump output is only 2½ gpm.

Another flexible hose carries pressure from the main supply line on the conveyor to the roof support props. This line is kept short by using the position-



HOW IT OPERATES

Two types of hydraulic supports, fore and aft, hold up the mine roof. Fore supports have two roof props, and connect to the conveyor through a double-acting cylinder. Aft supports have three hydraulic roof props, and connect to the conveyor through single-acting cylinders. In both types the props support a rigid roof beam.

During phase I in the above drawing, the cutter is moving to the left, cutting and dumping coal on the conveyor. When the cutter passes, phase II starts, and pressure is released in the props of the fore roof supports. Their cylinders then retract and pull the supports up to the conveyor. Once in position, their props are pressurized.

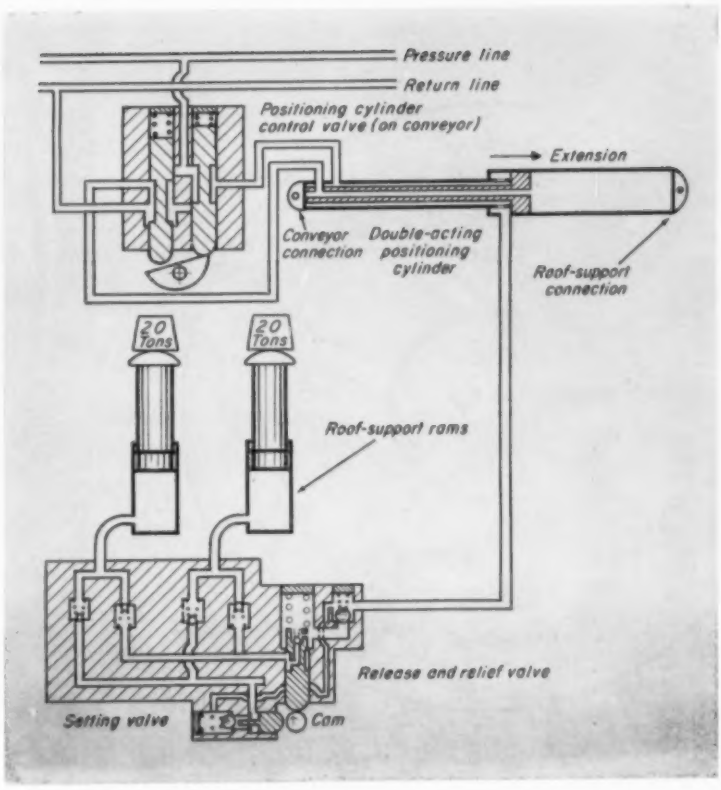
During the rest of phase II, the cylinders of the fore supports extend and push the conveyor into position for the next cut. As the conveyor moves, it pulls out the piston rods on the aft support cylinders.

In phase III, pressure is released in the props of the aft supports. Their single-acting cylinders retract and pull the supports up to the conveyor. Their props are pressurized, and the system is ready for the next cut.

EACH ROOF SUPPORT prop is connected to two opposed check valves. One allows flow into the prop but prevents return flow. The other permits flow from the prop to the release valve. This design allows the props to share a common relief valve, and prevents interaction between them. For maximum safety the valves are all housed in one block, and there is only one line under pressure from each support. If this line is damaged, pressure in the other roof supports is not affected.

The relief valve relieves pressure from the props when the loading reaches 22 tons, and reseats when the loading drops to 20-21 tons. A cam-operated release valve lowers the props. Prop setting valve is also cam-operated.

The positioning cylinder control valve has two plunger valves in one body, held in neutral by a spring. In neutral position, the valves are open to the return line. They are operated by a cam which actuates one plunger at a time. This assures that one line to return is always open. The positioning cylinder, mounted in the support base, has a hollow piston rod with two fluid passages. Connections to these passages are at the outer end of the rod. Fluid to extend and retract the cylinder flows through the rod and into the cylinder.



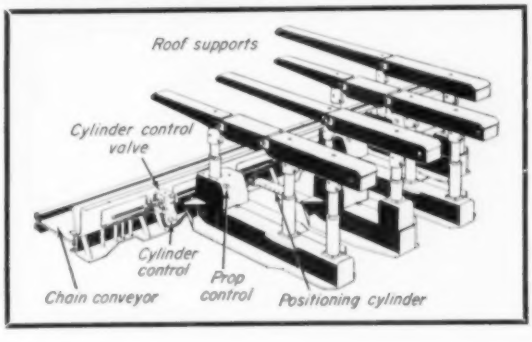
ing cylinder for a flow passage. Fluid flows through the hollow cylinder rod into the cylinder, and to and from the roof support props through the short length of flexible hose. Two short hose lines connect the control valve on the conveyor to the positioning cylinder. Pressure and return lines are piped to a power pack at the gate end.

System pressure is 2000 psi which is needed to operate the positioning cylinders. Pressure to the roof support props is reduced to 1000 psi to limit the maximum setting load to 9 tons. If the entire system was limited to 1000 psi, the positioning cylinders would be too large for the space available.

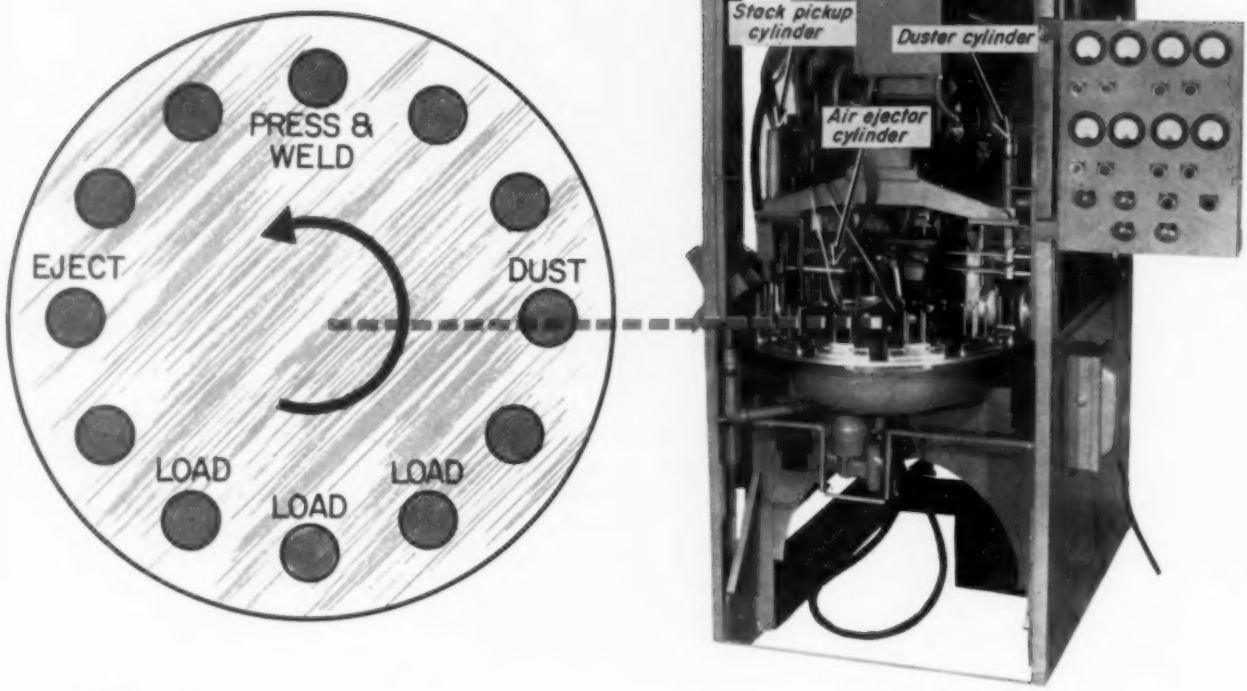
Sealing is another important factor in a system of this size. Since over 200 units may be used, careful attention was given to design to prevent leakage.

• **Power Pack**—A 5-hp motor and pump, each with a stand-by duplicate, are mounted on a 212-gal reservoir. Pumps have two stages and are pressure compensated. The first stage is a low pressure gear

Continued on page 122



HYDRAULIC CYLINDERS connecting the roof supports to the conveyor move the conveyor into position for the coal cutter. With the conveyor in position, the cylinders retract and pull the roof support in so that its supporting beam is over the conveyor. Metal shield protects control valves and hose lines from damage.



WELDING

How to electrically interlock a hydraulic index

• By WARREN C. L. FRICKE, *Design Engineer, Cayuga Machine and Fabricating Company, Depew, New York*

DESIGNERS of this machine started with a standard press and index table. Then they added hydraulic and pneumatic cylinders. By electrically interlocking the press's hydraulic ram and index circuit they got all the cylinders to move in proper sequence.

The machine welds lamina to form stator cores for small electric motors. The machine can automatically size, press and weld stators for any size fractional hp motor simply by changing the fixtures. The lamina welder is built around a 6-ton Denison modified strain-rod press equipped with a 12-station index table, having an extended 32 inch diameter dial. The work circle is 27 inches.

• **What it does**—Looking down on the dial, rotation is counterclockwise. The dial is hydraulically sequenced to turn one station each time the press rod is retracted. The circuit is interlocked so that the ram must be up while the dial turns. With the ram down, there is a dwell for the press, weld, eject, and loading of new parts.

A heavy, rigid platen moves up and down on special hardened and ground strain rods. This platen supports the four torches that weld across the outside of the lamina stack on the up stroke of the platen.

There is a light dusting of aluminum powder on the exterior surface of the lamina stack before welding to improve quality and speed of the weld.

Ejection of parts is also automatic. A pair of air-operated claws pick up the welded stack. An air-

STATOR LAMINATIONS are loaded onto fixtures and automatically indexed through all working stations. The machine will be completely enclosed and force ventilated.

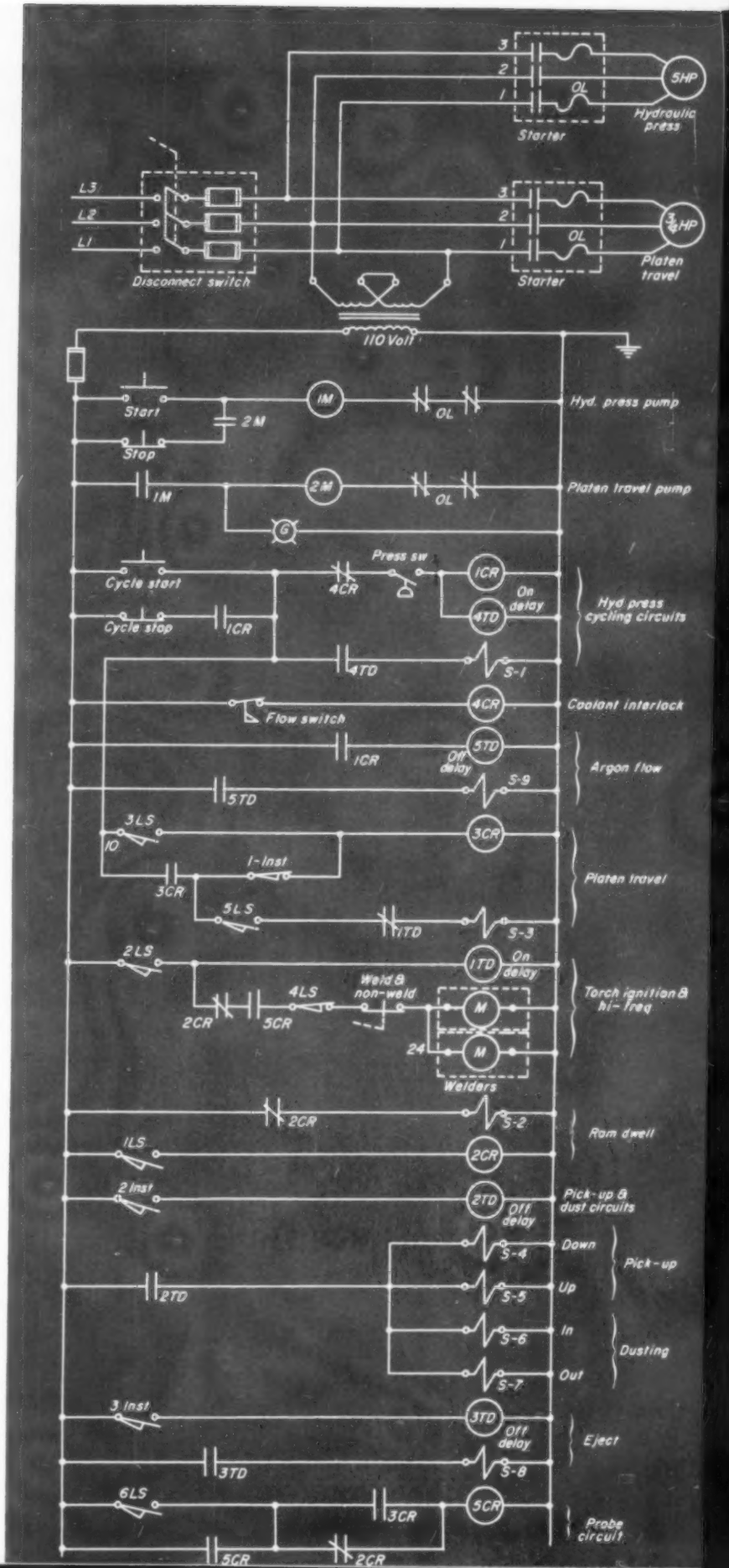
ELECTRICAL CIRCUIT. Both pumps are interlocked to start on one switch.

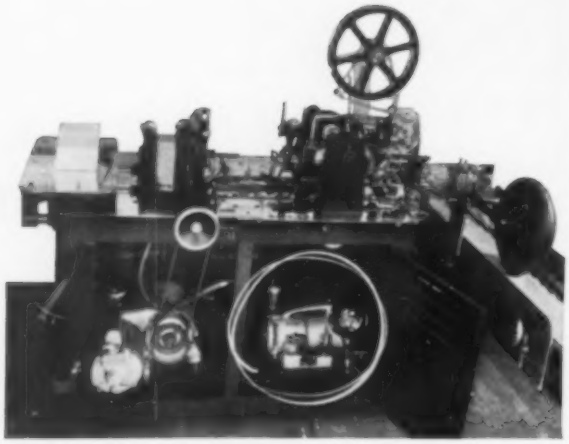
1. Cycle start button energizes 1-CR to start argon flow. After 2 to 3 second delay 4-TD energizes S-1.
2. Solenoid S-1 starts and maintains automatic operation of index table. With S-1 energized the press and table, sequenced hydraulically, will operate continuously.
3. 3-LS is tripped by one of 12 cams on table to energize 3-CR.
4. In weld position 5-LS closes to energize S-3 causing the platen carrying torches to descend.
5. Descending platen trips 2-inst to energize 2-TD. During ½ second time delay, contacts 2-TD are closed so that pickup and duster cylinders operate.
6. In its top position the pickup mechanism trips 3-inst to operate eject mechanism.
7. Ram travel, hydraulically sequenced, bottoms after the platen has bottomed. Ram must dwell in down position because S-2 is energized. 2-LS is tripped energizing 1-TD. After ½ second S-3 is deenergized.
8. Platen rises to perform welding operation.
9. At top of its stroke platen trips 1 inst and 1-LS to deenergize 3-CR and energize 2-CR. S-2 is deenergized allowing the ram to come up.
10. Table automatically indexes 30 degrees and cycle repeats.

operated kick-off device sends it into a chute.

There are twelve equally spaced sets of fixtures for holding the lamina stacks. Each has a socket and four pins. An operator loads the loose, but measured out, stacks manually onto the fixtures. The pins, fitting into the winding slots, align the lamina radially and hold them in place.

The ram head, mounted on the end of the press cylinder has a sizing plug which sizes the lamina stack before it is pressed.





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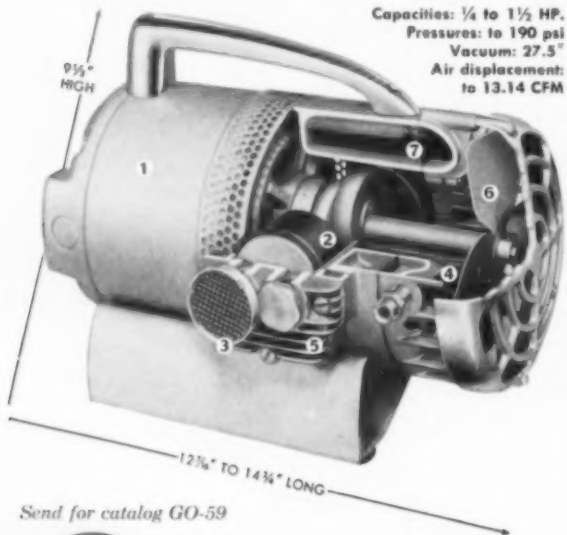

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HOW TO ELECTRICALLY INTERLOCK

• **Safety interlocks**—The low pressure system which powers the platen, pickup, and dust circuits has a pressure switch. It holds the cycle circuit open until there is sufficient pressure. The table can't rotate when the platen is down. Any movement could damage the fixtures or torch parts.

A flow switch mounted in the main coolant line prevents or stops operation through contact 4-CR if coolant flow falls below 3 gpm.

When the ram overtravels, as it would at an empty station, it actuates 4-LS, holding the welding contactors open. The platen ascends, but the torches do not ignite. This prevents damage to the work piece.

A probe circuit having 6-LS, detects a work piece and energizes 5-CR. If there is no piece, the circuit to the welders remains de-energized. The probe circuit is cleared by 1-inst each time the platen ascends.

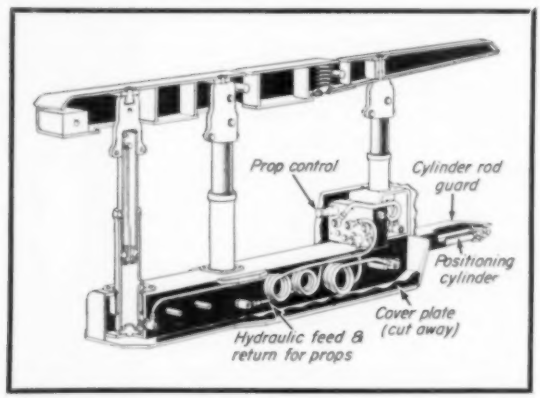
• **Why weld?**—Although riveting is now the more common way of assembling a stack of lamina, there are advantages to welding. It's cheaper because it uses no rivets. Welding makes a more rigid and uniform stack. The machine can produce up to 300 stators per hour. This is faster than riveting. □□□

PROTECTED PACKAGE DESIGN

Concluded from page 119

pump, and the second stage is a 7-plunger piston pump. Together they deliver 2½ gpm at 2000 psi.

• **Future Predictions**—The operational success of this system has opened the way for development of more advanced hydraulic support systems. Future plans include a further reduction of manually operated controls. The final goal is a completely automatic system with a cutter-loader which triggers the operation of the support system. A system of this design could be completely unmanned. □□□



CYLINDER, VALVES, and tubing are completely shielded with steel plate to protect them against damage. Prop control valves are housed in a steel block to assure maximum safety.

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Note these Advantages!

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Exceptional throttling — superior operator control.

Balanced plungers unaffected by high back pressures.

Machine operation can often produce high static pressures in blocked cylinder circuits. Built-in pilot operated relief valves may be provided in V-33 Valves as required for individual circuits.

All ports are machined for S.A.E. straight thread connections and TUBE-O fittings.

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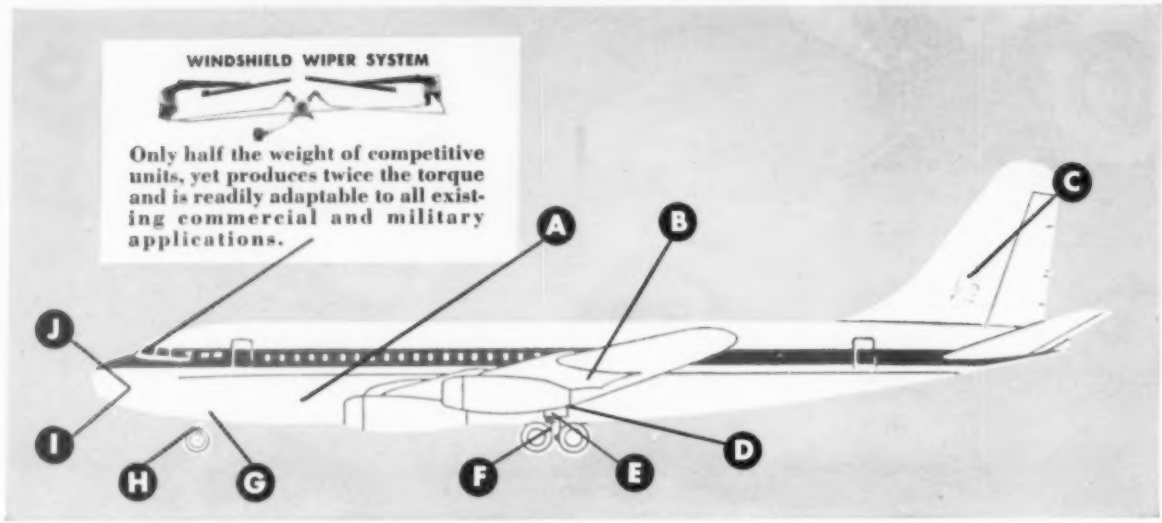


A SYSTEM MANIFOLD UNIT

Packages metallic filter, contamination indicator, 4-way, 3-pos. solenoid valve, relief valve, pressure reducer and multiple port connections to save weight and installation costs.

B 4-WAY, 3 POS. SOLENOID SELECTOR

Uses stainless steel forged body as the sleeve. This design eliminates more than half the number of packings usually required. Each position is pressure-actuated thereby eliminating dependence on springs.

C TANDEM SERVO ACTUATOR.

One-piece tandem construction of the spool and sleeve in the servo valve, machined to reproduce identical flow characteristics, insures optimum output requirements. These servo valves, with low plunger forces, have true linear flow obtained by rectangular orifices.

D 6 WAY, 4 POSITION SELECTOR

Combines the functions of two separate valves and controls the landing gear and landing gear doors, using only two solenoids.

E COMPOUND BRAKE ADJUSTER

Maintains an established clearance regardless of brake lining wear. It features a compound principle which compensates for master brake cylinders having limited displacement.

F BRAKE EMERGENCY VALVE

Meters fluid to each half of dual brakes and insures against complete brake system failure. Unit is a modification of our "AN" approved shuttle valves.

G DUAL PARKING BRAKE VALVE

Utilizes a "Belleville" washer cartridge to minimize size. Parking pin lock is stationary during normal operation and does not "steal" brake displacement. "Park" release is positive.

H STEER—DAMP UNIT

This advanced design has exceptional steering accuracy and shimmy dampening characteristics. It also has the highest torque output versus weight ratio available.

I DUAL POWER BRAKE

Unit contains normal and emergency brake valves and incorporates a transfer valve that senses loss of normal pressure and transitions to the emergency system. For use in a 4000 psi, 275° system.

J POWER-MANUAL BRAKE VALVE

A power brake valve when pressure is on which transitions to a master cylinder if system pressure is lost, thus eliminating the need for an emergency brake system.

HYDRA-POWER welcomes inquiries covering any* hydraulic *requirement — and if it's* electronic, *please contact our subsidiary "Power-tronic Systems, Inc.", same address.

HYDRA-POWER CORPORATION

PINE COURT, NEW ROCHELLE, N. Y.

APPLIED **Hydraulics** & **Pneumatics**

MAY 1959

AVIATION SECTION

ALL PNEUMATIC AIRCRAFT ACTUATION 126

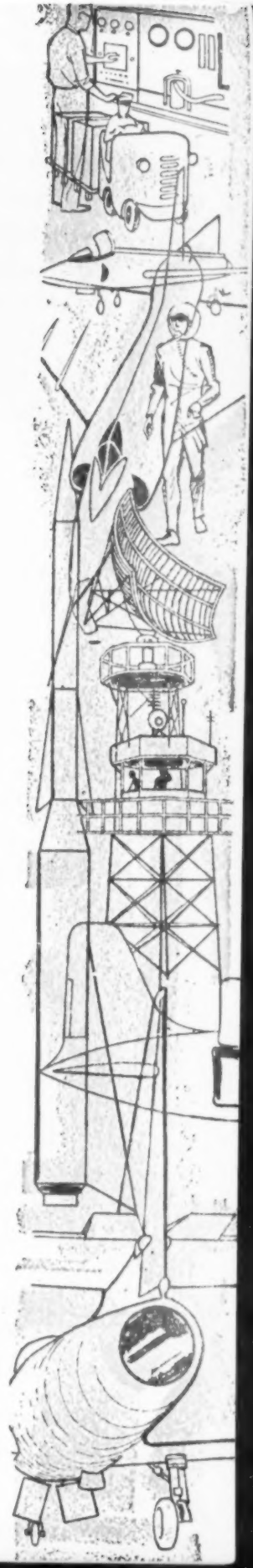
By John D. Hull, Jr. and A. E. Schmidlin

Pneumatic system of the F-27 transport is explained, along with some interesting sidelights on unusual components and rugged, compact subsystems. Emphasis is on lighter weight and faster operation.

AVIATION NEWS FROM THE FLUID POWER FIELD 130

AVIATION COMPONENT DATA 132

New products, services and literature of importance to designers of hydraulic and pneumatic systems for aircraft and missiles. For more information fill in and mail post card bound in this issue.



EDITORIAL ADVISORY BOARD

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Many factors favored the use of pneumatic systems on the F-27, most significant of which was an approximate 100 lb. weight saving over electrical and hydraulic systems.

Factors favoring F-27 pneumatic systems are:

- Lighter weight
- Faster operation
- No flammable liquids
- Cleaner and easier to maintain

AIRCRAFT

All pneumatic aircraft

• By JOHN D. HULL, JR., and A. E. SCHMIDLIN, *Walter Kidde & Co., Belleville, N. J.*

FAIRCHILD'S F-27 is the first American-made plane to use a complete pneumatic system to operate landing gear, wheel brakes, nose wheel steering, propeller brakes, and passenger door operation. It also has an emergency air supply which will lower the landing gears and operate the brakes.

Compressed air for the system is supplied by two 2-cfm 3300 psi compressors located in each of the engine nacelles. The compressors are driven through a gearbox by the Dart engines which power the aircraft. They carry their own individual dehydration and filtration equipment to supply clean, dry air at a pressure of 3300 psi. These two compressor packages are isolated from each other by a system of check valves, and can deliver air independently to replenish air to storage if an engine fails. Ground charging the system can be done through the dehydration and filtration circuit.

Three independent reservoirs isolated by a series of check valves store the system's air volume. The main storage is a 750 cu. in. steel cylinder, and the emergency storage is a 100 cu. in steel cylinder. The brake system uses a 100 cu. in. cylinder. It's fed by the main storage, and then isolated during flight so that the brake system will have sufficient pressure for a satisfactory operation. The main storage can be depleted to far below the braking pressure of 1000 psi, since the lowering of the landing gears only require 100 psi, and steering, 220 psi.

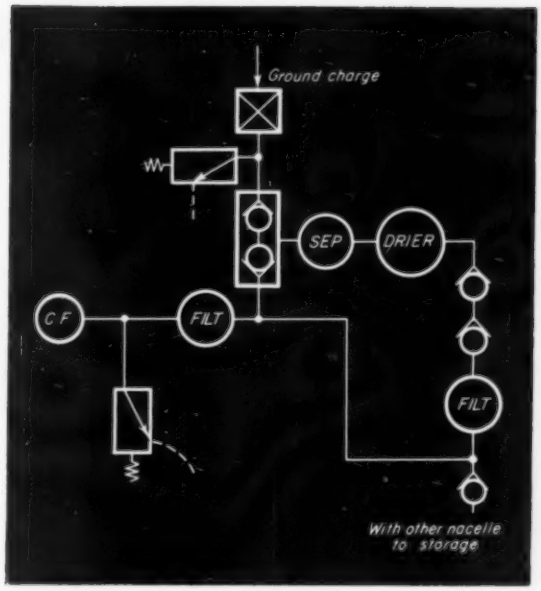
Locating most of the control valves on a panel simplifies service and maintenance. It also insures uniform environment for most of the control elements. The F-27 system is divided into at least five functional sub-systems.

• **Landing Gear** — This circuit has a solenoid operated control valve, a manual selector valve for emergency, a pressure reducer to control lowering, and a blowdown valve in the gear extension line. At the selection of the landing gear switch, the solenoid valve supplies air at 1000 psi to retract the gears, simultaneously venting the 1000 psi extension air. The opposite is true for extension. Electrical failure will not effect the solenoid valve because a mechanical lock will hold its selected position.

A manually operated blowdown valve vents the extension air when the landing gears are mechanically locked in the down position, leaving the entire system at atmospheric pressure for maintenance.

Manual selection for emergency gear lowering simultaneously vents the 1000 psi on the retraction side of the actuator, and supplies 100 psi from emergency storage to unlock and lower the landing gear. Grease dampers built into the landing gear actuators snub the motion of the gear. The uplock actuators are single-acting, spring return cylinders which operate with either normal or emergency air as do all the actuators for the extension stroke.

• **Nose Wheel Steering**—This circuit includes a solenoid valve, a pressure reducer, a servo valve, and an air motorball screw linear



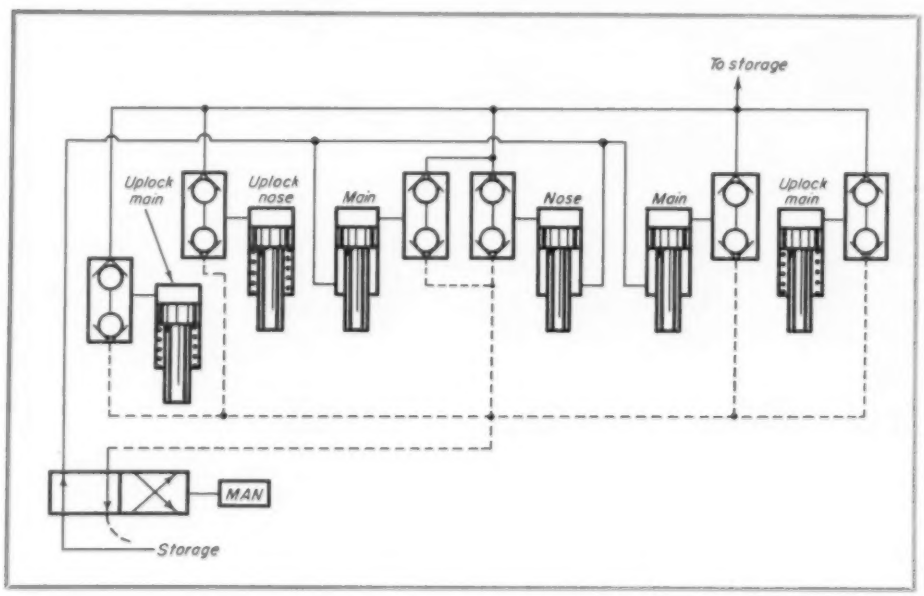
NACELLE-HOUSED COMPRESSOR delivers 2 cfm at 3300 psi. Check valve separates the two identical nacelle circuits.

actuation

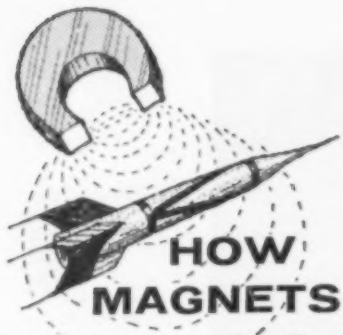
actuator. The solenoid valve controls the passage of air to the steering system and is operated automatically by switches arranged on the nose wheel which shut off the steering system when angles of greater than 60° port or starboard are reached, or when the nose wheel is off the ground. The steering actuator has a self-centering feature which centers the nose wheel when the air is shut off to the air motor, assuring that the nose wheel is centered before it is retracted.

The ball screw actuator is designed to give free castoring for the high loadings that occur during towing operations. The resulting use of a ball screw and many of the basic design features of the steering system were indicated by a nose gear design which had preceded the development of this nose wheel steering system. There is sufficient gain in steering performance in the F-27 to make it satisfactory.

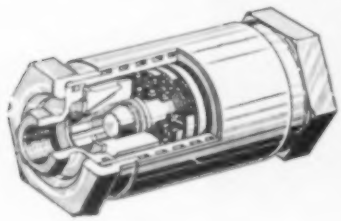
The servo valve is operated through a linkage connected to a steering wheel in the cockpit to provide for steering under load



SIX CYLINDERS ACTUATE AND LOCK the landing gear. 1000 psi air powers the retraction and 100 psi the extension strokes.



HOW MAGNETS help keep missiles and aircraft flying



FERROFILTER

Magnetic Separators

protect fluid power systems of missiles and aircraft by removing even microscopic ferrous particles that can jam delicate, precision made hydraulic equipment. Shown above, Model PX-2; dry weight only 3 lbs; 3000 psi working pressure; tapped for ½" tube connection-AND-10050.

the "works"

Liquid flows through stack of steel grids (left) magnetized by two powerful Alnico permanent magnets (one shown, right). The "honeycomb" design splits the fluid stream, and fine ferrous particles are caught on the grid edges.

Send for Bulletin 65-A

High pressure industrial FERROFILTER models are also available.

S. G. FRANTZ CO., Inc.

Brunswick Pike & Kline Ave.

P. O. Box 1138 Trenton 6, N.J.

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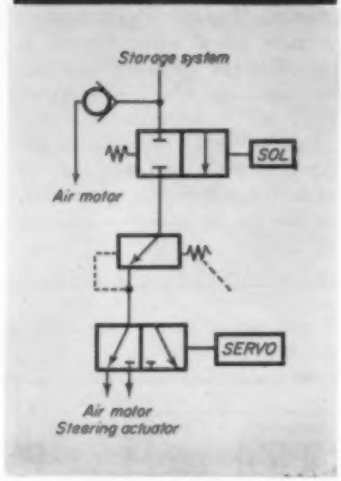
at any condition between inching and maximum rates.

• **Wheel Brakes**—System uses two foot-operated brake valves, connected in series with rapid exhaust valves, which allow rapid depressurization of the wheel brakes. These brake valves are of the variable pressure delivery type and are operated through a torsion bar linkage from the brake pedals in the cockpit. There is also an over-riding emergency system controlled by a hand-operated dual brake valve. This valve allows individual control of each wheel, so that differential braking for steering, as well as braking, can be accomplished during an emergency landing.



AIR MOTOR POWERED ball screw actuator in the nose wheel steering system is a unique device used for centering the nose wheel prior to retraction. Pneumatic circuit uses a mechanical servo valve for metering the required air.

• **Propeller Brakes** — Circuit uses two solenoid valves which meter the air to each of the propeller's brakes preventing windmilling of the props with the engine off.

• **Passenger Entrance Door**—Circuit is operated by a pneumatic actuator through the action of a solenoid valve control. The system will damp properly during emergency door openings and yet will not leak air in the passenger compartment during flight, since no stored air is required.

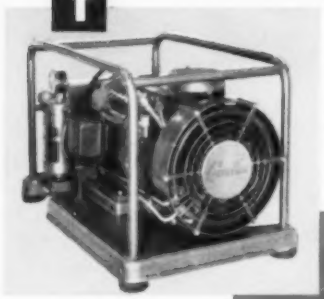
Why PNEUMATICS for aircraft actuation?

1. Weight—Pneumatic systems are considerably lighter in weight than their hydraulic or electrical equivalents. This difference becomes more marked with the wider use of fire-resistant fluids.
2. Viscosity — Air is stable within the wide temperature ranges encountered by present aircraft.
3. Fluid availability—Turbine or ram air is readily available for either storage or make-up.
4. Rapid actuation—Response rates in pneumatic systems are faster, increasing margin of safety.
5. Cleanliness—Lack of fluid-trapped dirt built up on operating components and fittings reduce maintenance time.
6. Versatility — Separate two or three pressure systems for the same aircraft are economically feasible.

3 LOW COST ANSWERS

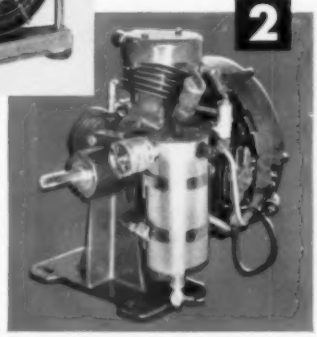
to a HIGH PRESSURE, 3000 psi, compressed air supply...

1



3750302 COMPRESSOR — **Pressures to 3000 psi; 3.5 CFM free air.** Equipped with 3 phase 220/440 volt motor. This model includes motor starter switch and pressure switch.

2



375304 COMPRESSOR — **Pressures to 3000 psi; 3.5 CFM free air.** Without motor, mounted on bracket, supplied with ¾" standard keyed shaft for pulley and V-belt drive.

3

42017 SERIES has integral electric motor. **1.75 CFM free air with pressures to 3000 psi.** Total weight: 38 lbs. Available in 110 volt or 220 volt, single phase A.C.

Combination oil and moisture filter-separator and safety relief valve is supplied with all units. Oil filtration effective to a maximum of 5 parts per million by volume. Dew point is between —8° F. and —20° F.

When you need a source of high pressure compressed air be sure to give full consideration to these Cornelius compressors. Each model delivers high pressures (up to 3000 psi). Each model is actually portable . . . may be moved anywhere with ease. The small size of each model lends itself to be included on your own OEM equipment. Each model provides new convenience because each is a "plug in type" source of high pressure air. Each model delivers air pure enough to breathe.

These small compressors may be just right for your OEM needs, lab work, production test or maintenance. They may not only answer your need but also save thousands of dollars compared to a large, permanent type compressor.

The small size and light weight of these industrial compressors does not penalize performance. They are rugged and dependable — *reliable*, in every sense of the word. Get the complete facts about these compressors. Write for free literature, or tell us what your needs are and we will furnish drawings, quotations and other information you require, *promptly*.

THE Cornelius COMPANY

AERO DIVISION

557 - 39th Avenue N. E. • Minneapolis 21, Minnesota

Pioneers in Pneumatic Systems for Aircraft

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Fall Wiper Ring SPRING LOADED

The Fall "CJ"* Wiper-Scraper Ring is Spring-Loaded causing Squeeze-Grip Action on the O.D. of the piston rod during entire cycle. This patented feature maintains a uniform, continuous pressure on the wiping edge of the ring at all times, stopping any buildup of foreign matter between the ring and the rod.

It automatically takes up wear, maintaining NEW RING PERFORMANCE. Available in diameters ½" through 13" for any commercial use. AN and MS numbers in use by the Military and Aviation industry since 1944. Manufactured in accordance with MIL-S-5249. (*Closed Joint)

ACE PRODUCTS CO.

1820 N. 12th St. Toledo 1, Ohio

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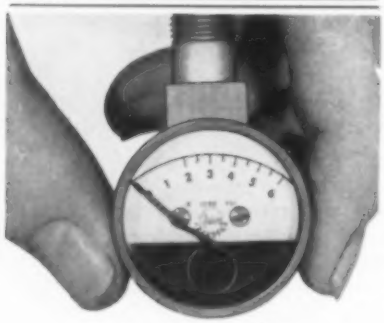


miniaturized *bh** gauges

Miniaturized **bourdon helix** gauges, pioneered by Glassco Instrument Company, have only one moving part. No gears, no linkage, they offer exceptional performance and reliability with minimum space and weight, plus design flexibility to meet unusual specifications.

For details, write for Bulletin G-1003

Glassco

Instrument Company

660 S. Fair Oaks Avenue • Pasadena 2, California

Circle **70** on Time-Saver Card

AVIATION NEWS

from the fluid power field

K. D. Garnjorst has been appointed Chief Engineer of the **Moog Valve Co.**, of Aurora, N.Y. He has served as Technical

K. D. Garnjorst
Moog Valve Co.

Assistant to the President, Chief Systems Engineer, and Director of Research for the company since 1954.

James H. Williams, general manager of the L-P Gas Division of **The Weatherhead Co.,** Cleveland, Ohio, has added the responsibility of export sales manager. Since 1949, he has served as regional sales representative, divisional sales manager, and general manager.

The **Test Equipment Division** of **Consolidated Diesel Electric Corp.** has received a $1,300,000 contract from the Air Force for portable hydraulic test stands.

The units will be used for servicing and testing hydraulic systems of jet fighters. The pressure source consists of two gasoline engine-driven pumps with 30-gpm and 3000-psi capabilities. Fluid systems filling and bleeding facilities are also built into the stands.

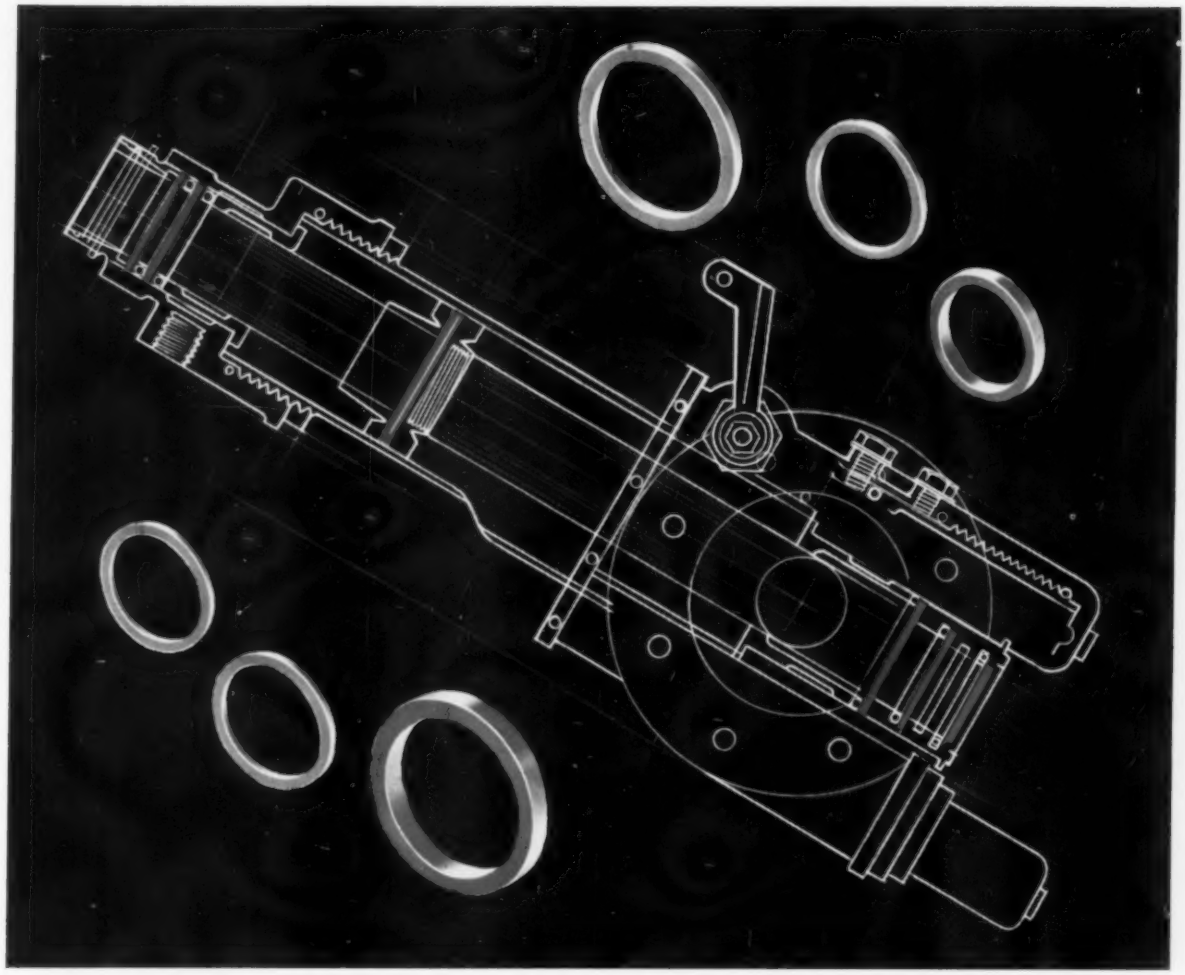
Tom G. Conway, Pesco Products Division of Borg-Warner Corp., Bedford, Ohio, is the new vice president in charge of manufacturing. Previously director of manufacturing services, Conway will now head the manufacturing operations of Pesco aircraft and missile fluid power products.

Robert T. Skinner, founder and Executive Vice President of the **Hydrodyne Corporation,** has assumed the presidency of that organization. He was founder and owner of Skinner Seal Co., now a division of Hydrodyne.

The **Aviation Division of Walter Kidde and Co.** and **Walter Kidde-Pacific** have changed the location of their Van Nuys, California office to 14943 Califa Street in that city.

OPERATOR CHECKS . . .

. . . the inside diameter of a hydraulic cylinder being produced in Chance Vought Aircraft Corp's. new hydraulic research and manufacturing facility in Dallas, Texas. The million-dollar facility has 20,000 sq ft of floor space and is equipped with 90 machines of all types for producing hydraulic assemblies.



Redesign with TFE resins puts faster punch in hydraulic system

The unique combination of properties offered by TEFLON TFE-fluorocarbon resins makes possible the design of more reliable, more efficient hydraulic systems. For example, a change to piston, back-up and wiper rings of TFE resins made a big difference in the speed of response to controls in the Lockheed 1049 Super Constellation. So greatly did these rings reduce friction, wear and oil leakage that, based on this experience, similar seals of Du Pont TFE resins were designed into Lockheed's new Prop-jet Electra.

Back-up rings of TEFLON TFE-fluorocarbon resins are far superior to conventional leather rings in deformation characteristics, wearability, temperature resistance and frictional properties. Piston-rod wiper rings give added protection against system contamination by dust, water, paint and cleaners. Piston-sealing rings of TFE resins, which need no high-pressure build-up for sealing, reduce oil leakage without increasing friction or piston wear.

The coefficient of friction of TEFLON TFE-fluorocarbon resins is so low that they require no lubrication. They can be used at cylinder temperatures up to 500°F. and are unaffected by even the most corrosive synthetic hydraulic fluids. Your local supplier listed in the Yellow Pages under "Plastics—Du Pont" can give you additional data. Or write to: E. I. du Pont de Nemours & Co. (Inc.), Polychemicals Dept., Room T-35, Du Pont Building, Wilmington 98, Delaware.

In Canada: Du Pont of Canada Limited, P.O. Box 660, Montreal.

DU PONT TEFLON

TFE-FLUOROCARBON RESINS

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

TEFLON is Du Pont's registered trademark for its fluorocarbon resins, including the TFE (tetrafluoroethylene) resins discussed herein.

Circle **52** *on Time-Saver Card*

CERTIFIED
SEALING
REPORT
NO. 6740

from the Research and Development Laboratories of Plastic and Rubber Products Company, 2100 Hyde Park Boulevard, Los Angeles 47, California. Telephone: AXminster 5-4331

DESIGN
PIONEERS
PICK
PARCO
O-RINGS

Hydraulic Research and Manufacturing Company pioneered the first electro-hydraulic servo valve to combine precision hydraulic design and operation with dependable dry coil construction without sacrificing performance. Like so many manufacturers of guidance system components, H-R looks to Parco engineers for the advanced rubber technology that makes Parco O-Rings mean reliability... for aircraft / missile or ground applications with the most critical temperature-pressure requirements.

Parco's R&D program assures the design engineer of the highest quality O-Rings, custom-molded and bonded-to-metal parts. Call your Parco Engineering Representative for answers to your sealing problems... he and the organization behind him are at your sealing service.

Write today for a free copy of Parco's 16-page, illustrated "Technical Data Reference Log," Catalog #1581.

Plastic and Rubber Products Company
2100 Hyde Park Boulevard
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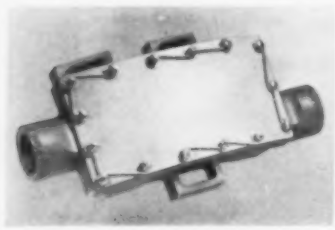
AVIATION COMPONENT DATA

Strainers and Filters . . . for missiles

Strainers can be mounted vertically or horizontally and are



available with capacities to 2000 gallons per hour. A by-pass system permits operation under icing conditions. Particle size elimination is to 10 microns.—*Koehler Aircraft Products Co., Dayton, Ohio.*

Circle **500** on Time-Saver Card

Pressure Transducer . . . uses bourdon tube

Instrument is accurate to 35g at 2000 cps vibration. No mechanical

linkages. Temperature range from —65 F to 200 F, pressure to 5000 psia.—*Bourns Laboratories, Inc., Riverside, California.*

Circle **501** on Time-Saver Card

Subsystems . . . and accessories

Aircraft and missile pumps, pressurization-dehydration units, servo-valves, servo systems, etc., are listed in a brochure giving specifications, dimensions, and power requirements. Illustrations, tables, and graphs are other design aids which are included.—*Eastern Industries, Hamden, Conn.*

Circle **502** on Time-Saver Card

High Temperature Pump . . . to 450 F

With a 7.3 gpm flow, the motor is rated at 11 hp at 4400 rpm with a 3000-psi differential. It is operable in fluid temperatures from

—65 F to 450 F. The overall efficiency remains the same whether the unit is operated as a pump or motor.—*Lear-Romec Div. Elyria, Ohio.*

Circle **503** on Time-Saver Card

Dehydrator . . . for 3000-psi use

Temperature range of —65 F to 165 F with a weight of 2.3 lbs

with this silica gel type dehydrator. Sintered metal filters are at the ports to prevent contamination. —*M.C. Manufacturing Co., Lake Orion, Mich.*

Circle **504** on Time-Saver Card

Continued on page 134

Cuts the time and cost lag between development and production

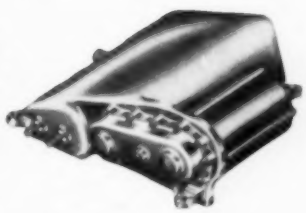
With each new design STRATOPOWER packs more and more performance into less and less space. This is evident in the equipment itself.

Less evident but no less true is the fact that each year STRATOPOWER is delivering more and more development results and production items in less and less *time*. This is because, at STRATOPOWER, contracted development is balanced with STRATOPOWER's own development effort to yield a continuous, well-rounded program of creative research in aircraft hydraulics.

No problem in hydraulics, however difficult, is ever completely dissimilar to projects already underway. The skill, tooling and materials are always at hand, whether the need is for testing at 1200°F (1200°F facilities were installed at STRATOPOWER early in 1958), production of a simple constant delivery pump (shipped by the thousands by STRATOPOWER), or development of a compact, complex hydraulic power package (such as the one shown in the accompanying illustration).

Talk to your STRATOPOWER representative. You may be surprised to hear him telling you what your hydraulic problems will be a year or two years from now. He knows, because STRATOPOWER is already there, anticipating the needs of the aircraft industry. It's no secret how STRATOPOWER licks the time lag to shrink the 4th dimension.

At STRATOPOWER, all lag-generating problems are solved yesterday.



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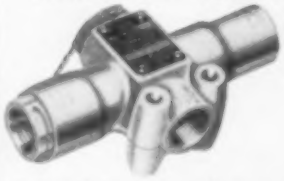
Circle **107** on Time-Saver Card

MC *hydraulic*

SHUTTLE VALVE

Lightweight . . . compact . . . backed by solid experience



Designed for tomorrow's usage, at temperatures from −65°F to +275°F. Design and manufacture of precision hydraulic and pneumatic valves, fuel pumps and air compressors has been the specialized activity of M.C. Mfg. Co. for many years. Call on our backlog of solid experience for built-in reliability in components for your applications.

Specifications

FLUID: Hydraulic and air or nitrogen
PRESSURE: 3000 psi
TEMPERATURE: −65°F to +275°F
OUT PORT: Regular or Banjo
WEIGHT: .34 lb.

M.C. MFG. CO.
P.O. Box 126 • LAKE ORION, MICH.

AVIATION COMPONENT DATA

O-Ring . . . with spring insert

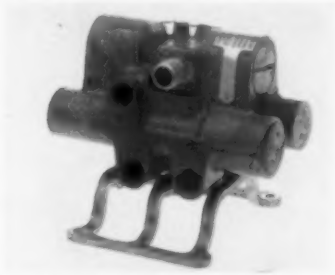
Eliminating the need for anti-extrusion devices at high temperatures, this seal can be applied in pneumatic and hydraulic systems equally well. Operating pressures are to 4000 psi, with temperatures

from −65 F to 600 F. May be cycled to 35 cpm, variable stroke from 1 to 5 in.–*Chance Vought Aircraft Inc., Dallas, Texas.*

Circle **505** on Time-Saver Card

6-Way Valve . . . has 4 positions

Combines functions of 2 valves which control landing gear and



landing gear door in a 3000-psi system. Only 2 solenoid pilot valves are needed for control.–*Hydra-Power Corp., New Rochelle, N.Y.*

Circle **506** on Time-Saver Card

Aircraft Components

Bulletin 1300 describes electric actuators, screwjacks, 400 cycle motors, and control equipment for aircraft, missile, ordinance, marine, and industrial applications.–*Hoover Electric Co., Los Angeles, California.*

Circle **507** on Time-Saver Card

Continued on page 136

KOHLER
PRECISION
CONTROLS
Specified by leading manufacturers of
GUIDED MISSILES
Superior facilities, experience—plus prompt deliveries—have built confidence in Kohler precision controls for aircraft, automotive and industrial installations. Our engineers develop controls to specifications for volume production. Write for information.
CHECK VALVES:
Connections:
MS-33514 Flareless tube and gasket seal
MS-24385 Flared tube and gasket seal
Operating Pressure:
1500 PSI and 3000 PSI
Proof Pressure:
2250 PSI and 4500 PSI
Burst Pressure:
4500 PSI and 7500 PSI
Temperature Range:
−65° F to 275° F
Material:
1500 PSI Aluminum
3000 PSI Stainless Steel
KOHLER CO. Established 1873 KOHLER, WIS.
KOHLER OF KOHLER
Enameled Iron and Vitreous China Plumbing Fixtures • Brass Fittings • Electric Plants • Air-cooled Engines • Precision Controls

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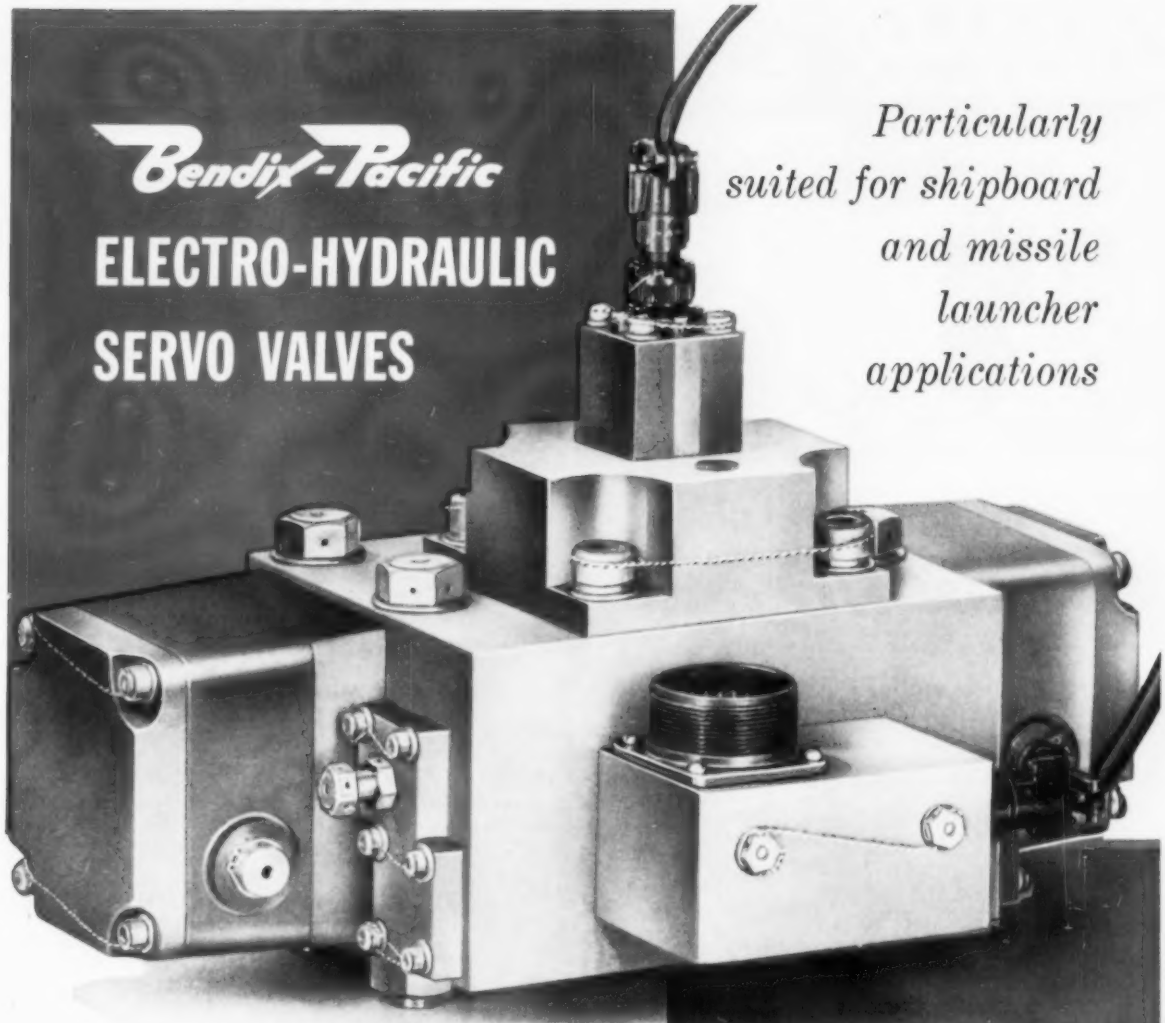
Bendix-Pacific

ELECTRO-HYDRAULIC SERVO VALVES

Particularly suited for shipboard and missile launcher applications



The latest additions to Bendix-Pacific's list of available components for high performance hydraulic systems is the Electro-Hydraulic servo valve shown here. This assembly, designed for HI-shock per Mil-S-901 B, provides flow rates up to 50 GPM at inlet pressures to 3000 psi. A novel poppet design in the first stage reduces overall null leakage (first and second stages) to 20 cc/min using oil per Mil-L-15017. Fluctuation of inlet pressure will not affect leakage or performance.

An integral magnetic amplifier is matched to the hydraulic assembly and rectifies 115 volt 400 cycle supply to DC at the first stage. Linearity is ± 5%.

The manual override provided on the second stage will actuate the valve to any position without electrical signal or even under a full electrical command.

Minimum contamination susceptibility is an inherent design feature with built in filtration and maximum spool loads.

A qualified sales engineer is available to discuss the application of this valve to your requirements, or write us for complete information.

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DIVISION OF BENDIX AVIATION CORPORATION
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for those really tough aircraft or missile applications

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Self-Sealing or Open Flow
Aluminum • Steel • Stainless

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- Excellent flow characteristics.
- Positive valve and seal action.
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HYDRAULIC, PNEUMATIC AND FUEL SYSTEM COMPONENTS

Circle **28** *on Time-Saver Card*

AVIATION COMPONENT DATA

Miniature Check Valves . . . have new seal

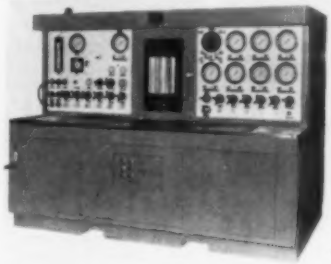
Using a new sealing method with a sharp edged, non-flowing, plastic material as a washer, this valve operates from —320 F to 700 F at pressures to 5000 psi. They

can be made in aluminum, stainless steel, titanium, or brass.—*Integral Corp., Hicksville, N.Y.*

Circle **508** *on Time-Saver Card*

Test Console . . . for missile components

Model 9500 console has an automatically regulated oil system delivering 20 gpm at 3000 psi or



9.7 gpm at 5000 psi. A manually operated source produces 20,000 psi for static testing. A fluid temperature is controlled to —2 F from ambient to 350 F. MIL-H 5606, MIL-O-7808, or Oronite 8515 oils can be used without change of seals.—*George L. Nankervis Co., Detroit, Mich.*

Circle **509** *on Time-Saver Card*

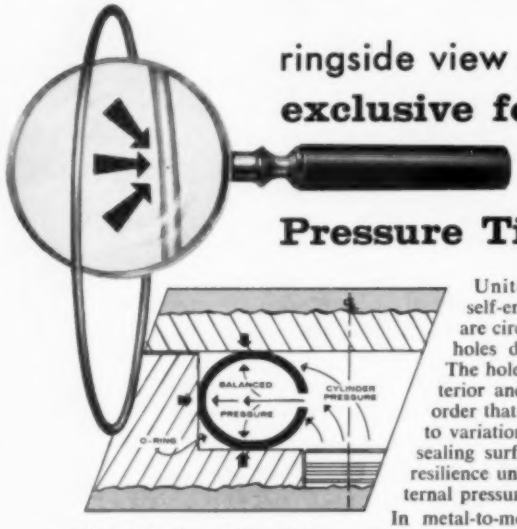
Missile Boss Connector . . . uses compression seal

By connecting tubing directly to the boss, the fitting eliminates

Continued on page 138

ringside view of United's **exclusive feature** for

Pressure Tight Seals



United's exclusive, patented* self-energized metallic O-rings are circular tubes vented by tiny holes drilled in the ring wall. The holes are to balance the interior and exterior pressures in order that the ring may respond to variation in deflection of the sealing surfaces with a natural resilience uninhibited by the external pressure.

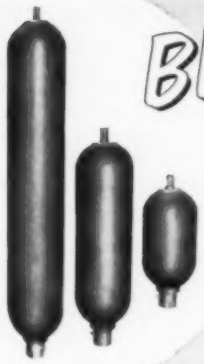
In metal-to-metal applications, self-energized metallic O-rings are capable of forming positive, permanent, non-corrosive static seals under extreme temperatures from —321°F. to 1800°F., and under pressures equal to ultimate compression stress of the metal itself. Available in various metals and finishes, 3/8" dia. to any size or configuration. United also makes non-vented and pressure-filled O-rings; and wire and brazing O-rings. Write for free 22-page booklet (on your letterhead please).

PATENTS 2,609,269; *2,837,360

UNITED METALLIC "O" RING CORP.
Dayton, Ohio • Box 1035
Division of United Aircraft Products, Inc.

Circle **165** *on Time-Saver Card*

GREER Headquarters for ACCUMULATORS



BLADDER
ACCUMULATORS

OVER 100,000 SOLD, some in continuous use for more than 15 years — proof of superior reliability, safety and dependability in a wide variety of circuit applications. Standard models available in two operating ranges: 0-3000 psi and 0-6000 psi, from 1.5 cu. in. to 2080 cu. in. capacities*.
WRITE FOR CATALOG PR-200.

PISTON
ACCUMULATORS

A NEW LINE of piston accumulators for standard industrial performance. Features extra built-in safety. Available for 3000 psi operation in nine sizes from 10 cu. in. to 2250 cu. in. capacities.
WRITE FOR BULLETIN IPA-1.

SPECIAL
ACCUMULATORS

FOR AIRCRAFT, MISSILE or industrial applications requiring bladder accumulators in special shapes, sizes or operating characteristics. Standard bladder-type transfer-barrier accumulators available in two pressure ranges: 0-3000 psi an 0-6000 psi in a variety of sizes*. Contact your Greer representative with your requirements.

*U.S. Licenses under Olaer Patents

Most Experienced Designer and Producer of Accumulators

GREER HYDRAULICS, INC.

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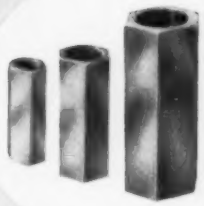
Distributors and Other Representatives in Principal Cities

Circle **73** *on Time-Saver Card*

GREER VALVES Dependable-Versatile

CHECK
VALVES



High pressure—low pressure drop. Operating pressures to 10,000 psi. Self-aligning floating poppet. Sealing actually improves with use. Available in NPT and JIC portings
Eight sizes: 1/4" to 2".
WRITE FOR BULLETIN 512.

UNIBLOCK
SHUT-OFF VALVES with Interchangeable Flanges

1" VALVE CARTRIDGE available separately for insert manifolding

Basic valve bodies available in 2" and 1" straight-through and 1" angle. 100 different combinations possible with 2" valve; 225 with each 1" valve. Male and female flanges in pipe-thread, JIC thread, welded or brazed piping. Pressures to 7500 psi in aluminum, 10,000 psi in steel. Valves feature low pressure drop, high throttling control, zero leakage, low maintenance.
WRITE FOR BULLETIN TV-12.

NEEDLE
VALVES

Extra long sharp needle, 10° taper, 40 aircraft threads per inch for ultra-precision control of system flow. Straight-through or angle flow patterns in brass, carbon steel and stainless steel bodies. Pressures to 10,000 psi. Low torque to operate
WRITE FOR BULLETIN 901.

NEW PRODUCTS AVAILABLE SOON!

CONE SEAL SELECTOR VALVE (shown) — new design for the most exacting operating requirements. 6 sizes: 1/8" to 1".

SUCTION AND LOW PRESSURE FILTERS — new design provides 10 micron filtration for 30, 60 or 90 gpm flow.

HIGH PRESSURE FILTERS — designed for 10 micron filtration. Pressures to 7500 psi. 10 gpm single, or 20 gpm double unit.

Specify "Greer-Engineered" Standard Valves and Filters

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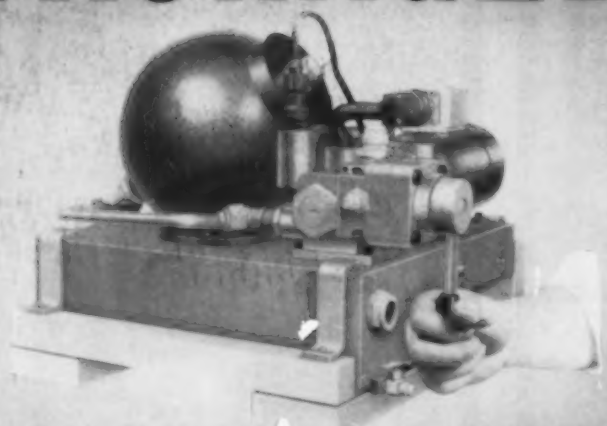
Distributors and Other Representatives in Principal Cities

Circle **185** *on Time-Saver Card*

27 lbs. of PACKAGED



POWER

A NEW DEVELOPMENT OF THE AERO SUPPLY MFG. CO. INC.

COMPACT HYDRAULIC POWER SOURCE SUPPLIES **10 G.P.M. AT 1500 PSI** FOR SHORT TIME REQUIREMENTS

The unit is designed to be airborne (weight: 27 pounds), and finds its prime application where a short time high peak supply of hydraulic power is needed to actuate equipment such as large volume piston actuators. The package contains: (1) motor, (2) pump, (3) check valve, (4) filter, (5) reservoir, (6) pressure relief valve, (7) accumulator, (8) manual 4-way valve, (9) pressure switch, (10) sight gauge, (11) drain and fill ports, (12) vent ports. While it requires low electrical input power (24 Volts DC, 30 amps), its output is high pressure (1500 psi) at high flow (10 G.P.M.) for short periods (5 sec.). Built to precision specifications, this latest Aero Supply development is the forerunner of a family of lightweight packaged hydraulic power units. Request Bulletin #59-127 and our complete capabilities report.

ENGINEERS WANTED . . . If you would like to join a growing dynamic creative organization, send your resume to our Chief Engineer.

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CORRY, PENNSYLVANIA
ELECTRO-MECHANICAL DEVICES • ENGINEERED FLUID CONTROL SYSTEMS • PRECISION MANUFACTURING

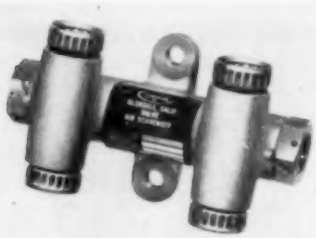
AVIATION COMPONENT DATA

one connector and one sealing point, reducing weight. O-rings are eliminated for high temperature use. Flareless fittings permit use in cryogenics and with non-flarable high tensile tubing.—*Weatherhead Co., Cleveland, Ohio.*

Circle **510** *on Time-Saver Card*

Air Scavenger Valve . . . to 4000 psi

This unit removes air by permitting flow from the pressurized line to the non-pressurized line



when the servo cylinder is stopped. Temperature range to 325 F. Can be used with any hydraulic fluid.—*Conair Inc., Glendale, California.*

Circle **511** *on Time-Saver Card*

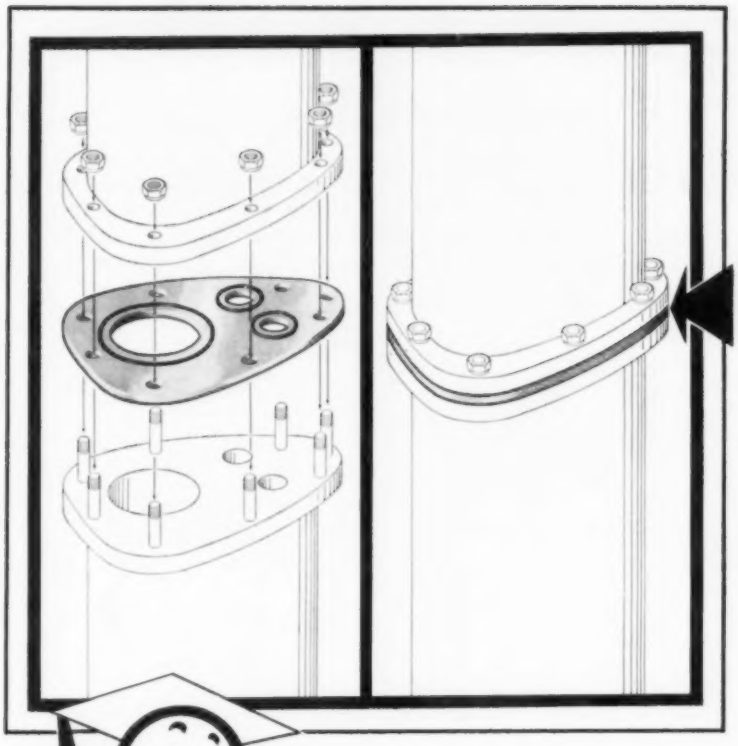
Cooling Water Disconnect . . . for missile use

Nonmetallic components make this valve non-conducting as well as heat resistant. The socket body is of glass-filled epoxy resin to

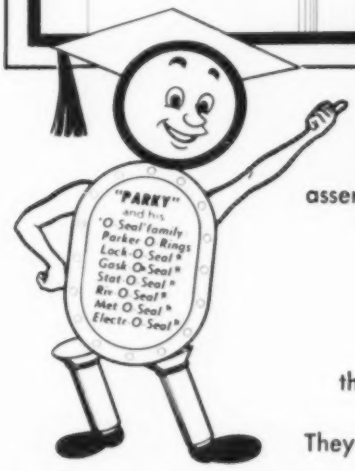
reduce electronic interference. Weight—.30 lbs; pressure drop—1 psi at 1.5 gpm; disconnect force—1.5 lbs.; temperature range—minus 65 F to 200 F continuously and 1000 F for 30 seconds.—*Symetrics, Inc., Santa Monica, California.*

Circle **512** *on Time-Saver Card*

DO YOU KNOW ABOUT GASK-O-SEALS?

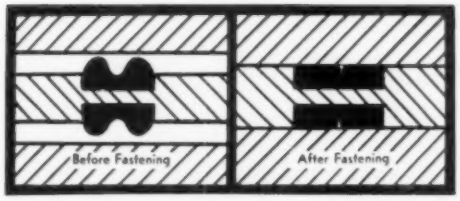


You Can't leave a Gask-O-Seal® out!



Hundreds of accidents have been caused by seals being left out during assembly or repair, and thousands of production hours have also been lost for the same reason. Just one of the plus values of Gask-O-Seals is that they are practically impossible to leave out because they are inspectable visually after assembly. This can mean many valuable warranty dollars saved, many hours of downtime saved — and it may mean the saving of human lives.

They also provide no-leakage positive sealing, prevent blow-outs. Damaging coldflow is eliminated, high manufacturing and maintenance machining costs are avoided and they are reuseable. If you use static seals in your designs, why not find out about Gask-O-Seals — made by the makers of Parker O-rings.



Parker SEAL COMPANY

CULVER CITY, CALIFORNIA and CLEVELAND, OHIO

A DIVISION OF PARKER-HANNIFIN CORPORATION

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NA-700 LINE OF SOLENOIDS

The ultimate design in
Guided T Plunger Solenoids

Developed in 1952
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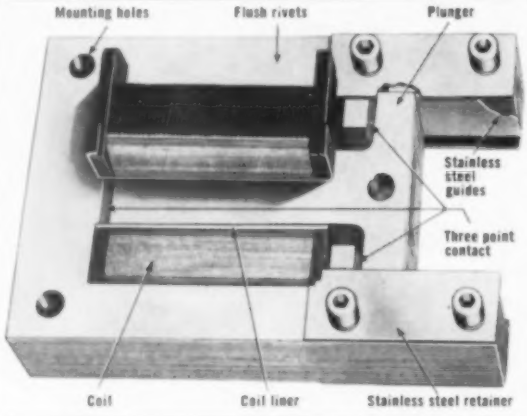
THEY ARE OURS!!!!



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FEATURES
Positive three point contact
Heavy stainless steel guides

RESULTS
Longest life expectancy; reliable operation throughout entire life; silent operation in sealed position; mountable in any position, at any angle; no heavy grease required to cover up poor design; no grunting when mounted horizontally.

AVAILABLE
In a multitude of standard sizes, pull or push type; also custom built to satisfy customer's requirements; also for OEM, and replacement trade.

TROMBETTA has the original solenoid.
Don't let anyone sell you imitations.
Request additional information.

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is the answer to:
ALL SOLENOID QUESTIONS

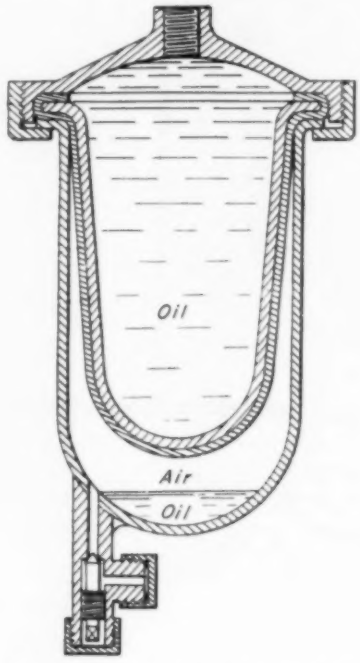
Circle **161** *on Time-Saver Card*

FLUID POWER PATENTS

HYDRO-PNEUMATIC ACCUMULATOR

The assembly is made up of an outer shell in the shape of an inverted bell, an inner bell made of porous, sintered metal, and a rubber diaphragm.

Hydraulic fluid is stored above the diaphragm. The volume below the diaphragm is pressurized with air or



nitrogen. The accumulator top and outer shell are held together with a threaded ring screw. The rubber diaphragm serves as a seal.

Diaphragm movement is limited by the outer shell and the porus metal, inner bell. Diaphragm has long life since it is not folded or creased.

The volume of compressed air in the accumulator can be reduced by adding oil to the air chamber.

U. S. Patent No. 2,851,059 Rene Lucien, Paris, France.

CYLINDER LOCK VALVE

A special valving arrangement locks the piston of a double-acting cylinder if system pressure falls below a set limit.

The system consists of a pump, reservoir, accumulator, manually-operated control valve, pressure isolator valve, and a double-acting cylinder.

When the control valve is in neutral, as shown in the drawing, the center land on the control valve

Continued on page 142

NEW *LOW COST*

DOLLINGER SUMP FILTER

FOR COOLANTS, HYDRAULIC OILS AND LUBRICANTS

Molded End Seals Reduce Cost
. . . eliminate costly machining. Special plastic impervious to all synthetic oils, mild acids, coolants, and water to 300° F.

One Piece Construction
No spare parts necessary. Positive protection against dirt, sludge, rust and abrasive particles causing pump failure.

Exclusive Radial Fin Design
Permits larger filter capacity in smaller area. Mesh screen supplied in 60 or 100 screen depending on efficiency desired and fluid viscosity.

New low price—made possible by a new, simplified filter design.

All new design—As a result of a nationwide study to determine the actual service conditions for sump filters, this new Dollinger Sump Filter was designed. Already, leading hydraulic equipment manufacturers have standardized on this filter for their products. The new design incorporates molded end seals made from a specially formulated plastic impervious to all synthetic oils at temperatures to 300°.

***Eight standard sizes* available. Capacities from 5 to 100 gpm.**
Get complete facts, write for New Sump Filter Catalog 330-H.

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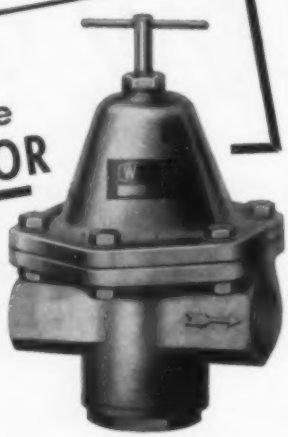
WILKERSON

announces

NEW larger size REGULATOR



Model 1021-16

for air, water or hydraulic service

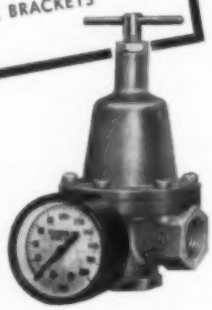
From ¼" P.T. to 2" P.T. in 15-85 and other pressure ranges. (Also available as remote control model)

NOW **you can obtain the reliable accuracy and positive performance of the Wilkerson quality from ⅛" up to 2" P.T.**

- Rugged, all-bronze body
- Monel metal seats
- Non-chattering
- Larger diaphragm area. Big ports and valve openings
- Low pressure drop

Other NEW features

- PANEL MOUNTS
- REMOTE CONTROLS
- FOOT MOUNTINGS
- PLASTIC KNOBS
- TAMPER-PRUF KITS
- LO & HI PRESSURE RANGES
- 2 NEW GAUGES
- WALL BRACKETS



Models of this type are available from 1/8" to 1" P.T. size, which are self-relieving and balanced valve regulators.

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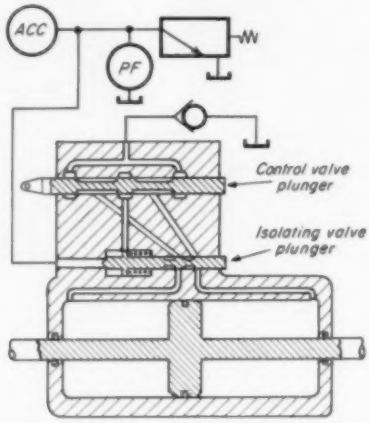
Circle **178** on Time-Saver Card

plunger prevents fluid from entering the cylinder through the isolating valve.

Pump pressure on the left end of the isolating valve plunger moves it to the right, keeping the pressure port to the control valve open. With the plunger in this position, the cylinder is connected to the control valve.

If the control valve plunger moves to the right its center land uncovers the pressure port and lets fluid



flow through the passage in the isolating valve to the left side of the cylinder. If the plunger is moved to the left, the system works in reverse and pressurizes the right side of the cylinder.

However, if system pressure falls below a set amount, the spring forces the isolating valve plunger to the left closing the pressure port. This movement also closes the passages from the control valve to the cylinder and hydraulically locks the piston.

U. S. Patent 2,860,607, George Orloff, assigned to British Messier Ltd., Gloucester, England.

Other Patents Issued

SERVO CONTROL UNIT
No. 2,874,682 by Henry A. Vander Kaay, assigned to The New York Air Brake Co., Kalamazoo, Mich.

LINEAR SERVOMOTOR
No. 2,868,175 by Johan Elis Forslund, Skelleftea, Sweden.

CYLINDER WITH REVERSING VALVE
No. 2,868,177 by Clinton L. Graybill, Superior, Mont.

FLUID REGULATING VALVE
No. 2,867,089 by James K. Parmerlee, assigned to B. F. Goodrich Co., New York.

PNEUMATIC REMOTE POSITION ACTUATOR
No. 2,867,194 by Raymond W. Jensen, assigned to The Garrett Corp., Los Angeles, Calif.

CUSHIONING DEVICE FOR CYLINDERS
No. 2,870,744 by Harold C. Hallerstrom, assigned to Hanna Engineering Works, Chicago, Ill.

PROBLEM: *Which fire-resistant fluid is best for your particular operation?*

SOLUTION: *Ask the only manufacturer who makes all three!*

HOUGHTO-SAFE 600 SERIES
(*Water-Glycol Fluids*)
Adequate for 85% of all hydraulic systems; provides maximum fire protection with good lubricity for systems running below 150°F. temperatures.

HOUGHTO-SAFE 1000 SERIES
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Available in three viscosities for systems running as hot as 150°F. and where maximum lubricity is needed for heavy bearing loads.

HOUGHTO-SAFE 5040 SERIES
(*Water-Oil Emulsion Fluids*)
Lower cost, fire-resistant fluids that are stable, afford good lubricity and provide adequate fire protection where hazards are intermittent or remote.

Selecting the *right* hydraulic fluid depends upon operating pressures and temperatures, pump and equipment design, degree of fire hazard, and other important factors. But to make sure you get a completely unbiased recommendation —call in the only manufacturer who makes all types.

Houghto-Safe fire-resistant fluids have proved themselves in industry's toughest hydraulic applications—not only as life and property-savers, but as efficient protection against excessive pump and packings wear. Houghto-Safe is also used extensively by the U. S. Navy for such critical carrier applications as deck-edge elevators and catapults.

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HOUGHTO-SAFE HYDRAULIC FLUIDS

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Circle **84** on Time-Saver Card

Circle **98** on Time-Saver Card

NEW! KEPNER Kepsel

cartridge type valve insert

The Check Valve that cuts costs of Design and Installation 75% and more!

- Leak Proof—At All Pressures
- Low Pressure Drop at Full Flow
- Eliminates All Threaded Connections
- Eliminates Expensive Machining

Small in size—big in capacity—simple to install—the KEPNER Kepsel Cartridge Type Check Valve is designed for positive performance. Eliminates expensive machining, finishing of fine, close tolerances, metal surfaces—dirt can't hurt it.

Write for complete technical data

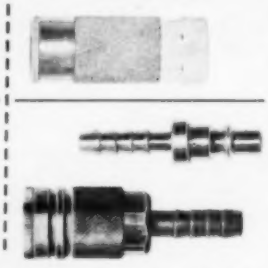
*Patent Applied For

KEPNER PRODUCTS COMPANY
7321 West 59th Street Summit, Illinois

Circle **162** on Time-Saver Card

TRU-FLATE

interchange couplers for every industrial application



Couplers and nipples with many types and sizes of inlet ends available that will interchange with competitive makes. There is a *TRU-FLATE "type"* or a *TRU-FLATE "interchange" coupler* to meet every industrial need.

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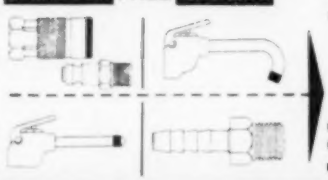

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TOG-OIL®

Double-Acting, Toggle Linkage HAND PUMPS

- Variable Leverage Ratio up to 3.5:1
- Models for 1000, 3000, and 10,000 P.S.I.

HYDRO-WHEEL®

Makes Platform Lifts SELF-PROPELLED

- Gives 360° Steering
- Simple, Safe, Easy-to-Install

- ► Rotary Pumps
- ► Needle Valves
- ► 4 and 5 Way Valves

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MECHANISMS CO. 118 E. 2nd St. Uhrichsville, Ohio

Circle **112** on Time-Saver Card

SAVE ON NEW & SURPLUS HYDRAULICS

NEW PALLEY HYDRAULICS

Here are two of our newly developed line of double action industrial Hydraulic Cylinders. These cylinders are designed to meet the most rigid requirements of industry. All are heavy duty steel construction. SAVE!

Type (A) is a heavy duty, press type cylinder with bores of 3", 5", 6" and 8" – thrust ranges up to 75 TONS at 3000 PSI.

Type (B) is an internal cup type cylinder with bores of 1-1/2", 2", 2-1/2", 3", 3-1/2" and 4". Has a thrust range of 2" to 48". Delivers up to 18,850 lbs. of thrust on 1500 PSI line pressure.

For COMPLETE LISTING of our tremendous ON-THE-SHELF stocks and prices – Send for Cat. H-59.

3000 PSI HAND PUMP

Operates up to 3000 PSI. Has a built-in return flow check valve. Inlet port ½" AN, outlet 1/4" AN. No. HP-30 Only 22.50

1500 PSI Hydraulic HAND PUMP Displaces 0.19 GPM at 30 cycles per min. Capacity 1.5 cu. in. per cycle. No. HP-3U 6.88

NEW HEAVY DUTY SLIDING PISTON 4-WAY VALVE

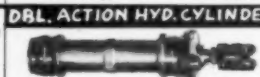
Available in Open or Closed Center. 3000 PSI type available with spring return or detents. 2000 PSI type has spring return to neutral. Specify type needed. Both have built-in adjustable relief valve. Maximum flow is 10 GPM. Order either 2000 or 3000 PSI type. SAVE at our LOW PRICES!

2000 PSI type $24.50
3000 PSI type $32.75

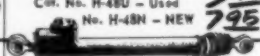
STRATO POWER HYD. PUMP

Delivers 10 gal. per minute at 1500 RPM at 3000 PSI. Pressure is adjustable from 2800 to 3800 PSI. A variable displacement, piston type. Displaces 1.694 cubic in. per revolution. 99.50

DBL. ACTION HYD. CYLINDER



1500 PSI. Has 2" bore, 9" stroke, 7/8" shaft, 1-1/4" length. Approx. Gov't cost – $75 Cat. No. H-48U – Used 5.95 No. H-48N – NEW 7.95



Ideal for clutch or throttle control when used as a master & slave. Bore 5/8", stroke 4-1/8", shaft 7/16", length 9-5/8". Parts 1/4" tube. NEW. Cat. No. H-60 3.75

NOTE: We stock the largest ON-THE-SHELF stock of Hydraulic Equip. in the World. Stocks include Hydraulic Pumps, Valves, Cylinders, Motors, Hose and fittings of all kinds. Write for Catalog section H-59 and SAVE!

Buy by M.O. or Check. P.O.'s accepted from D&B firms rated F2½ or better. 1/2 deposit with C.O.D.'s. Prices F.O.B. Los Angeles Whse.

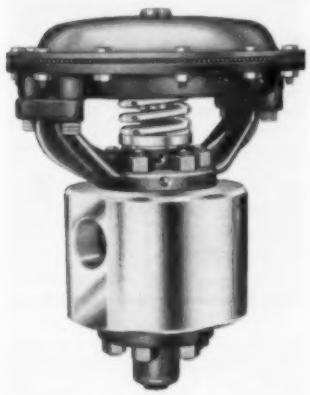
palley's 2263 E. Vernon Ave. Dept. AH-49, Los Angeles 58, Calif.

Circle **123** on Time-Saver Card

NEW PRODUCTS

5000 PSI AIR VALVES
. . . are diaphragm operated

Features: Screw-mounted, diaphragm-operated valves for precise control of ultra-high pressure air. Afford smooth, shockless opening and closing at top rated pressure, plus fast response and lead-free operation. Sleeve construction with aluminum bronze billet or alloy steel bodies. Replaceable hardened stainless steel seat sleeve insert in



valve body maintains alignment of valve stem and seats.

Specifications: To 5000 psi, in 2 and 3-way types, NO or NC, in ½ and ¾ in. NPT sizes. Up to 3 in. NPT, flange-mounted valves are available. Operating pressure is 35-40 psi.

Sinclair-Collins Valve Co.
Akron, Ohio

Circle **309** *on Time-Saver Card*

HYDRAULIC FLUID
. . . is highly fire-resistant

Designation: Pydraul A-200
Features: High resistance to compression. Excellent lubricity and stability. Compatible with all other commercially available all-synthetic hydraulic fluids. Highly fire-resistant. Formulated compound based on halogenated hydrocarbons. Minimum of equipment conversion allows use in present petroleum fluids systems.

Monsanto Chemical Co.
St. Louis, Mo.

Circle **310** *on Time-Saver Card*

Continued on page 147

Now Rotary Torque Actuation, fully cushioned!

The
CARTER
ROTARY TORQUE ACTUATOR
Patents Pending

Explore the cost reduction you can get with safe, low-cost, Carter Rotary Torque Actuators—Now with built-in cushions for longer, more dependable performance.

No by-pass leakage

Built-in cushions

Rotation to 370° as standard

Positive locking, no back-off under tension or power failure

Complete range of sizes

Proven in thousands of applications during the past 4 years!

The Carter Rotary Torque Actuator has opened unlimited new possibilities in design and cost reduction. Transfer mechanisms, indexing, positioning, cam actions, valve operation, and many other applications become more effective and economical.

Here is safe, powerful, Rotary Torque. Actuated by air, oil, water or gas. Patented seal assures leakproof performance. Internal helical design prevents back-off under reverse tension, shock, vibration or complete power failure.

Available in 4, 5, 6, 8, 10 and 12" diameters. Special sizes and rotation requirements are available. Ask your Carter representative or write for all the details!

Complete power package units available

SEND FOR NEW BULLETIN

Bulletin R.A. 500 gives complete details and specifications on the Carter Rotary Torque Actuators. Every engineer and designer should have a copy. Send for yours today!

CARTER
CONTROLS, INCORPORATED
2972 Bernice Road, Lansing, Ill.
Phones: Lansing—GRanite 4-3305 • Chicago—BAyport 1-7186

Circle **31** *on Time-Saver Card*

Circle **58** on Time-Saver Card

AUTOMATING?

Keep It Simple

with the
ELECTRO-SNAP
One-Way Impulse
PRECISION
LIMIT
SWITCH

Type ES4-KM2 shown

Before finalizing design on your automatic tools or systems, get full details on the ELECTRO-SNAP ES4 family of switches. Many variations available . . . all trouble-savers!

- Fewer switches needed.
- Simpler, cheaper than timers.
- More reliable than fancy circuitry capable of same job.

WRITE FOR DATA SHEET ESF-5
ELECTROSNAP CORPORATION
Switch Division
4224 W. Lake Street, Chicago 24, Illinois
Telephone: VAn Buren 6-3100
TWX NO. CG-1400

ELECTRO SNAP

Circle **163** on Time-Saver Card

TRU-SEAL

TEFLON SEAL

Saves hours in piping installations

PAT. PENDING

Eliminates leaks in oil, air, water, vacuum, chemical lines

Tru-Seal saves hours in assembling piping installations because it enables you to run your pipe lines in any direction you wish, quickly and easily—without having to recut and re-thread piping sections. Wherever used on air, oil, water, steam, vacuum or chemical lines, it seals perfectly at —100° F. to plus 500° F.—*without the use of pipe dope.* Its installation requires only light tightening torque, thus eliminating over-tightening damage to valves, pumps, compressors, and other fittings.

For further information write

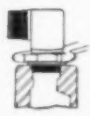
TRU-SEAL DIVISION
FLICK-REEDY CORPORATION
7N017 York Rd., Bensenville, Ill.

"Miller Fluid Power" is also a Div. of Flick-Reedy Corp.

1. Thread Tru-Seal on pipe or fitting as far as it will go hand tight. SEAL SIDE

2. Thread pipe or fitting 3 threads into port. Point in desired direction.

3. Tighten Tru-Seal to complete leakproof assembly (only light torque required).



Modernair

VIH (VALVE-IN-HEAD) CYLINDERS

Save Space, Weight & Piping

NO SEPARATE VALVES TO MOUNT OR PIPE . . . Modernair's VIH cylinders have directional and exhaust speed control valves built in!

FEATURES:
- *COMPACT CYLINDER-VALVE "PACKAGE" includes built-in directional control, exhaust speed control valves.
- *SOLENOID, BUTTON BLEEDER or PILOT PRESSURE valve operation.
- *INTERCHANGEABLE MOUNTINGS.

BRIEF SPECIFICATIONS:
DIAMETERS: 1½", 2", 3" ROD SIZES: ½", ⅝", ¾"
MIN. OPERATING PRESSURE: 20 p.s.i.
MAX. OPERATING PRESSURE: 150 p.s.i. (solenoid)
200 p.s.i. (bleeder or pilot pres.)

38

Write for catalog, prices today—or phone your local MODERNAIR distributor (listed on your phone book Yellow Pages).

Modernair CORPORATION

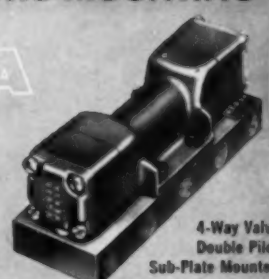
Dept. B5, 400 PREDA STREET, SAN LEANDRO, CALIF.
5007 BROOKPARK RD. CLEVELAND 34, OHIO

Circle **115** on Time-Saver Card

FOR SUB-PLATE MOUNTING

VERSA

Manifold Mount VALVES



4-Way Valve
Double Pilot
Sub-Plate Mounted

For any type of operation . . . there's a Versa Control Valve available for manifold mounting. These efficient, compact Control Valves are ideal for incorporation as original equipment. They can be installed directly on equipment or mounted on standard Manifold Plates (or Sub-Plates).

Versa Manifold Mount Valves are available with any type of actuating device, in sizes from 1/8" to 1" NPT, in 2-, 3-, 4-, and 5-Way Types, and for pressures from partial vacuum to 500 PSIG.

Over 110,000 Variations . . .
Available for Immediate Delivery!

VERSA

VERSA PRODUCTS COMPANY INC.
248A SCHOLES STREET, BROOKLYN 6, N.Y.

Circle **167** on Time-Saver Card

NEW PRODUCTS

HYDRAULIC GEAR PUMPS
. . . are pressure-balanced

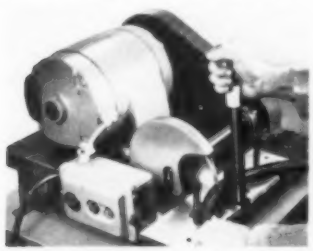
Designation: Dowty
Features: Minimum of working parts. Pressure-balanced, self-compensating design eliminates major cause of internal leakage. Has wide range of operating

speeds, pressures, temperatures, oil viscosities. Low noise level. Pulsation levels remain practically constant in amplitude throughout operating range. Flange and foot mountings in all sizes.
Specifications: Operates at pressures to 2500 psi. In 14 sizes in 4 model groups having outputs from 1 to 60 gpm. Cast aluminum housing. Medium size has weight-to-hp ratio of under 1 lb.

Berry Hydraulics
Division of Oliver Tyrone Corp.
Pittsburgh, Pa.
Circle **311** *on Time-Saver Card*

CUT-OFF MACHINE
. . . for wire-braided hose

Designation: Model 332
Features: For cutting industrial cotton or rubber covered, fabric, or wire-branded hose through 2" i.d.



Cutting wheel is belt driven, has 8" diameter, and made of hi-speed steel, hardened and ground for smooth, dust-free, long-life service. Guards shield moving parts.
Specifications: Has 1½ hp, 110-220

Continued on page 149

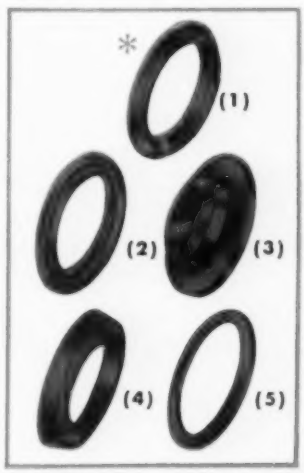
ALL BACK-UP WASHERS ARE NOT ALIKE

This photograph shows Marsh No. 612 back-up washers being slipped into position. The washers s-t-r-e-t-c-h manually, or with production tooling, over pistons and SNAP BACK to original size. Allows quick installation of piston into cylinder without danger of pinching.

MARSH No. 612 *Thermo* Leather non-extrusion washers have many superior features . . . used in supporting O-rings and V blocks in cylinders and tube fittings.

- **Rubberlike stretch with unaided dimensional recovery into groove.**
- **Synthetic rubber impregnant impervious to ALL hydraulic fluids.**
- **Sealing: air—petroleum base oils—synthetic fluids (water soluble and insoluble) — transmission fluids—solvents.**
- **Operating temperatures: —65° F. to 212° F. plus.**

For toughness unmatched, giving maximum protection against nicking by dirt and grit . . . with low friction and a minimum cold flow . . . try the Marsh No. 612 back-up washers. Available to all commercial and military dash numbers with the more popular sizes in stock.



(1) VEE PACKING • (2) U PACKING • (3) FLANGE PACKING • (4) CUP PACKING • (5) NON-EXTRUSION or BACK-UP WASHERS

Marsh impregnated *Thermo* Leather packings are custom engineered to individual specifications . . . to fit special temperature ranges . . . to meet specific pressure requirements.

ENGINEERING AND CONSULTING SERVICE — Laboratory Test Reports available on sealing fire-resistant fluids. Write for your free copy today.

C·W·MARSH COMPANY

MAIN OFFICE AND FACTORY: MUSKEGON, MICHIGAN

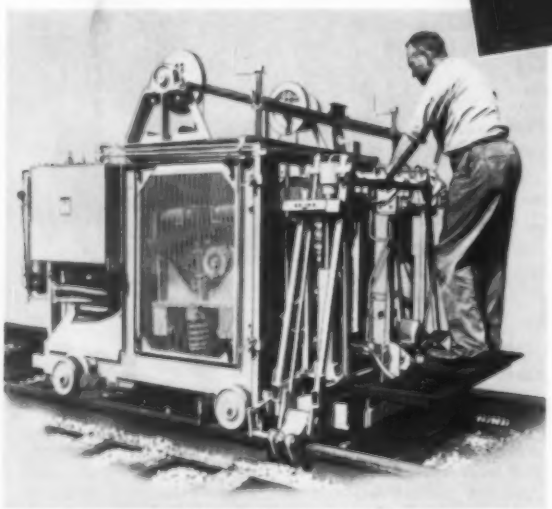
SALES OFFICES: 75 E. Wacker Drive, Chicago 1, Ill. | 101 Park Avenue, New York 17, N. Y. | 1900 Euclid Ave., Cleveland 15, Ohio

Circle **109** *on Time-Saver Card*

Hydraulic power for the Hopto line of equipment, by Warner-Swasey, is delivered through cylinders of ROCKRITE Tubing.

JUST CUT TO LENGTH AND USE . . . ROCKRITE®

CYLINDER-FINISH TUBING



For ram assemblies of its specialized railway track maintenance machinery, Nordberg Manufacturing Company uses stock size of ROCKRITE Tubing in the Tamping Power Jack.

Why continue with high-priced methods of cylinder fabrication — when ROCKRITE Tubing *costs less?* Leading manufacturers of dependable equipment have proved it. ROCKRITE provides extremely high surface finish and dimensional tolerance — needs no boring or honing — can be cut to length and standardized into cylinder production!

And on the job, ROCKRITE cylinder finish assures longer packing life! A mirror-like surface, free of longitudinal scratches and burrs, is a quality-controlled feature of the ROCKRITE method.

In low carbon grades, ROCKRITE Tubing is available from all leading Steel Service Centers. Available also, to your exact specifications, in a wide range of analyses, sizes, lengths and mechanical properties. Write for full details now.

Write for Technical Bulletin R-10 **which describes the ROCKRITE method and advantages! Tube Reducing is a leading supplier of SAE 52100 tubing for high speed production of anti-friction raceways for the ball bearing industry — and *guaranteed* quality tube for the special tubular component needs of the aircraft, ordnance, missile and nuclear industries.**

ROCKRITE® TUBING

9-070

TUBE REDUCING CORPORATION

A SUBSIDIARY OF AMERICAN METAL PRODUCTS COMPANY

520 MAIN AVENUE, WALLINGTON, N.J. • MAILING ADDRESS: P.O. BOX 959A, PASSAIC, N.J.

NEW PRODUCTS

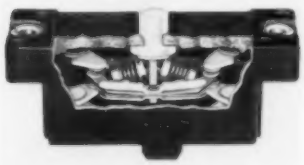
volt, 1750 rpm, single-phase electric motor. Machine is 20x23x18" and weighs 135 lbs.

Parker Fittings & Hose Division
Parker-Hannifin Corp.
Cleveland, Ohio

Circle **312** *on Time-Saver Card*

LIMIT SWITCH
. . . has contact mechanism

Features: Unique contact mechanism provides extended life, incorporating movable assembly utilizing 2 compressed coil springs to pro-



vide quick make and break action. A leaf spring assures constant contact pressure, eliminating points of zero contact pressure, and providing non-teasing action even with slow operating motion. Contact carrier spring affords sufficient contact wipe to assure good electrical contact on low voltage. Enclosed in semi dust-tight, molded phenolic case.

Specifications: Electrical rating of 600 volts.

Cutler-Hammer Inc.
Milwaukee, Wisc.

Circle **313** *on Time-Saver Card*

LINE STRAINERS
. . . in many sizes

Features: Dual screen design gives heavy, outside screen to protect against surge and bursting; fine-mesh inside screen for straining. Screens supported top and bottom by flange collars to provide seal fit and rigidity. Easily flushed. Under normal conditions, each strainer can take to 75% blocking with less than ½ lb. pressure drop. Top outlet for gauge mounting on larger capacity models. In stainless steel, brass, cast iron.

Specifications: Pipe connection sizes ¼ to 4". Flange connections for 3, 4, 6" pipe. Special strainers for high pressure lines to 5000 psi.

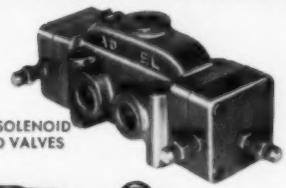
Spraying Systems Co.
Bellwood, Ill.

Circle **314** *on Time-Saver Card*

Continued on next page

ADEL *Reliability in Your Hydraulic Systems*

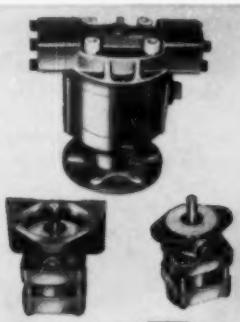
BETTER MACHINE CONTROL...
FOR BETTER MACHINE PERFORMANCE



PILOT OR SOLENOID OPERATED VALVES

VOLUME (FLOW) CONTROL VALVES

DIRECTIONAL CONTROL VALVES



GEAR-TYPE HYDRAULIC PUMPS

New Industrial Gear Type Hydraulic Pumps with capacities from ¼ to 35 GPM at pressures to 1500 PSI and speeds to 3600 RPM.

The diagrams show but two of innumerable circuits and systems where these versatile pumps and control valves can be used to advantage.

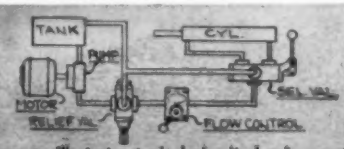


Diagram illustrates typical circuit showing control of cylinder.

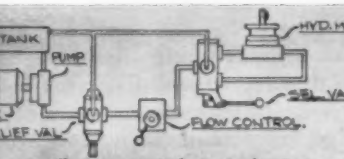


Diagram illustrates typical circuit showing control of hydraulic motor.

For metal working machines, industrial equipment, farm machinery, construction equipment, motor vehicles and marine applications... *Specify* ADEL *Precision-Engineered Hydraulics* for every mechanical operation in every industry.

Complete engineering specifications are available upon request.

Reliability
ADEL PRECISION PRODUCTS
A DIVISION OF GENERAL METALS CORPORATION
1444 WASHINGTON AVENUE, HUNTINGTON 4, WEST VIRGINIA

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86 Hudson St., Hackensack

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OHIO
Industrial Air & Hydraulic Equipment Company
3207 Cambridge St., Toledo
Wyatt Sales Corporation
1900 Euclid Ave., Cleveland 15

OREGON
Ray Bobbs Air-Draulics Inc.
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PENNSYLVANIA
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301 E. Hunting Park Ave., Philadelphia
Frank T. Donnelly Company
P. O. Box 11527, Pittsburgh 38

RHODE ISLAND
Lincoln Supply Company
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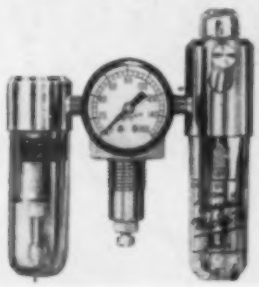
WISCONSIN
Neff Engineering Company
5856 N. Port Washington Rd.
Milwaukee 17

Circle **4** *on Time-Saver Card*

NEW PRODUCTS

LUBRICATING UNIT
. . . is compact

Designation: Lubro-Control
Features: Complete, efficient processing of compressed air for service to air cylinders, air chucks, air tools, bearings. For air flows from .05 to 20 cfm. Unit contains air filter, pressure regulator, lubricator. Filter has transparent reservoir, directional air inlet, sintered metal filter element. Requires no tools for servicing. Regulator for 5 to 100 psi. Lubricator has maximum line pressure of 150, top regulated pressure is 100, and maximum operating temperature is 120 F.



Specifications: For ⅛ or ¼" pipe installations.

C. A. Norgren Co.
Denver, Colo.
Circle **315** *on Time-Saver Card*

it's

Lassman for unusual

HEAVY-DUTY EQUIPMENT

Lassman Trunnion Cylinders offer extra features unobtainable in the usual designs. Among these are hydraulically balanced swivel pipe connections which permit rigid installation of piping, eliminating hoses or other fittings and their incident troubles. This is particularly important when considering large cylinders or high pressures.

This style of cylinder is only one of many, all of which embody "extra" features of design and construction; features that, as a result of our long experience in building heavy-duty hydraulic equipment, mean trouble-free performance.

We will be pleased to receive your inquiries.

Quality EQUIPMENT for *Quality* PERFORMANCE

BENJAMIN LASSMAN & SON Route 8, GLENSHAW, PA.

Circle **102** *on Time-Saver Card*

POPPET CHECK VALVE
. . . maintains full flow

Features: Adaptable for wide pressure range. For use on instrument, process and control lines to allow flow in one direction instantly and automatically stop flow in reverse direction. Full flow maintained with low pressure drop. Simple design, positive action. Special-type assembly eliminates chatter problem. Withstands high pressures.

Specifications: Compact, 2⅛" from end to end. In brass, stainless steel, Monel, aluminum, nylon. Available with Swagelok ends.

Nuclear Products Co.
Cleveland, Ohio
Circle **316** *on Time-Saver Card*

FIRE-RESISTANT FLUIDS
. . . in 4 viscosities

Designation: Mobil Pyrogard
Features: For heavy-duty installations involving radial-piston pumps and high pressures. Fire-resistant. Fits need of many hydraulic systems.
Specifications: In four viscosities, #42, 43, 53, 55.

Socony Mobil Oil Co., Inc.
Lubricating Department
New York, N. Y.
Circle **317** *on Time-Saver Card*

SINGLE TUBE FILTER
. . . in stainless steel

Designation: SS7.5C
Features: One-piece stainless steel shell. For operations requiring minimum chemical reaction between filter and fluid. In cotton nylon, orlon, dynel, acetate, or glass fibres. In wide range of precision densities to provide to 1 micron degree of continuous microclarity.

Continued on page 152

1. Bronze Bearing, with self-adjusting "U" Cup Piston Rod Seal for longer wear.
2. Rod Wiper protects Piston Rod Seal and keeps Cylinder clean.
3. "U" Cup Seals expand with pressure to provide positive seal with minimum friction.
4. Wrench Flats make for easy installation.
5. Ground, hard chrome-plated Piston Rods have minimum yield strength of 125,000 psi.
6. Self-locking cushion adjusting screw and ball check are below surface for protection . . . easily accessible.
7. For extra strength, Cylinder Ends and Mounting Plates are machined from bar stock and steel forgings.
8. Cylinder is precision-finished brass for extra heavy duty.
9. Variety of mountings can be interchanged—easily match any installation requirement.
10. Interchangeable with all JIC Cylinders.

SCHRADER SQUARE-END CYLINDERS

meet and exceed JIC specs . . . 250 psi air . . . 750 psi hydraulic!

Here's compact, versatile straight-line power. Just look at the features!

Use Schrader's new square-end double-acting cylinders for holding, positioning, moving work—for push, pull or lifting—for automating manual operations. In five sizes up to 4-inch bore, and with five interchangeable mountings, these "square-ends" are economical and versatile. Bolt, leg, flush, side flush or base . . . each JIC Cylinder will mount all five ways. Suitable for air pressures to 250 psi, or hydraulically to 750 psi—available cushioned or non-cushioned.

You get safe, controlled, low-cost power with Schrader "square-ends"—another addition to the line of famous Schrader quality Air Control Products.

Complete stocks available locally—expert help to improve your air control hookups. Write for your complete specifications and data on these new "square-ends."

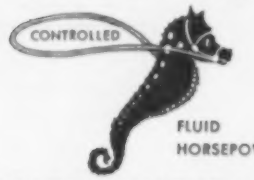
Bolt Mounting **Leg Mounting** **Flush Mounting** **Side-Flush Mounting** **Base Mounting**

A. SCHRADER'S SON
Division of Scovill Manufacturing Co.
456 Vanderbilt Avenue, Brooklyn 38, N. Y.

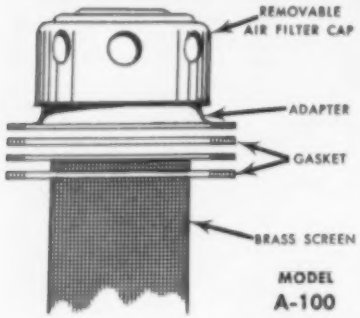
Schrader®
a division of SCOVILL

QUALITY AIR CONTROL PRODUCTS

Circle **128** on Time-Saver Card



FILLER-BREATHER CAPS



REDUCE YOUR COSTS

1 to 4 — $4.00 10 to 24 — $3.10
5 to 9 — $3.50 25 and up — $2.80

PAUL-MUNROE CO.
6430 EAST GAGE AVE.
BELL GARDENS, CALIFORNIA

NEW PRODUCTS

Specifications: Top air flow rate is 650 scfm at maximum operating pressure of 750 psig, with initial loss of 3 psi. Maximum flow rate of 5 gpm for thin liquids. Cores of steel, stainless steel, tinned steel, copper, tinned copper, nickel, PVC, or phenolic-impregnated paper. Straight line pipe connections (dry seal thread) have standard ¾" NPTF.

Commercial Filters Corp.
Melrose, Mass.
Circle **318** on Time-Saver Card

CONTROL VALVE
. . . for both directions

Features: Allows independently controlled flow in either or both directions. Female threaded to dryseal specifications. Extreme dependability, low friction loss, greater flow at all temperatures claimed due to unique 2-way design which eliminates internal gaskets, springs, or hinged parts. Units may be adjusted anytime with screwdriver. A straight-through ball-valve principle permits sensitive adjustment, lessens clogging.

Specifications: In standard IPS from ⅛ to ¾". To 5000 psi.

True-Flo Valve Co., Inc.
Everett, Mass.
Circle **319** on Time-Saver Card

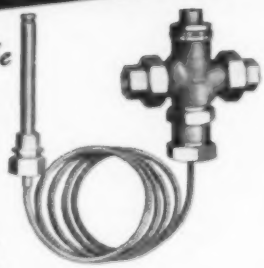
OPERATING VALVES
. . . either 3 or 4-way

Designation: Durable Seal
Features: Same line pressure acts both inside and outside U cup seals at all times during operating cycle. Seals are floated across ports without distortion, shear, or undue wear. No distortion of stainless steel piston or of pedestals which position U seals. Gives positive control, easy operation.
Specifications: Sizes from ½ to 2" in 3 and 4-way types, and to 6" in 2-way or spray valve type. Have

Continued on page 154

If your equipment or process requires . . .
ACCURATE, AUTOMATIC TEMPERATURE CONTROL
for HEATING or COOLING (using STEAM, WATER, or HEAT TRANSFER FLUIDS)

There is no equal to the
Sterlco®
Series 150-E
TEMPERATURE CONTROL VALVE



Here is a quality, dependable, and low cost self-actuated automatic modulating control valve. It's compact, self-contained; and, as part of your equipment or process, will eliminate the human factor of manual valves. Balanced single-seated construction eliminates effect of pressure variation. Send for Bulletin #505.

MOUNTS *and* OPERATES *in* ANY POSITION

INDUSTRIAL CONTROL DIVISION
STERLING, INC.
5202 W. Clinton Ave. • Milwaukee 18, Wis.
Circle **154** on Time-Saver Card

AIR-MITE AIR CYLINDERS

Compact—
Powerful—
Rugged—
Low Cost!

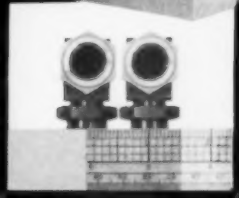
AIR-MITE Cylinders—made in Single or Double Acting Series, in 4 mounting types, are high quality cylinders at a low price. Simple, rugged design and compact construction give them long life, permit easy mounting on jigs, fixtures, tools, or machines. Used wherever power holding, pushing, pulling, or lifting is required, AIR-MITE Cylinders will meet your most exacting requirements of dependability and long life. Write for complete catalog and prices.

QUALITY FEATURES:
1. Ground and polished steel ram
2. Brass, true-bore cylinders
3. High strength aluminum alloy cylinder heads
4. Bronze oilless ram bushing
5. Five steel tie rods

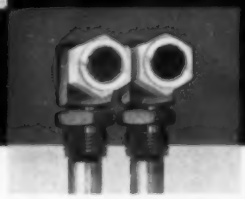
AIR-MITE DEVICES, INC.
4401 W. Kinzie St., Chicago 24, Ill.
Circle **7** on Time-Saver Card

FLODAR "Metal-to-Metal" No Swing Port Fittings

No Swing Radius — Only 1" center-to-center spacing needed for ½" fitting.



Ideal for Straight Runs — Complete tube assemblies including elbows & tees can be bench assembled.



Metal-to-metal seal — Fitting gains its own seal as it is tightened — eliminating leakage.

Get these five exclusive features:

- Eliminate fluid system leakage
- No swing radius needed
- No special seat preparation required
- Elbows & Tees can be positioned accurately
- "O"-rings completely eliminated

Fittings Protected by U.S. and Foreign Patents. Other Patents Pending.

J.I.C. APPROVED

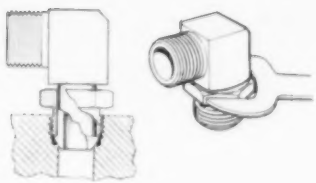
• The new FLODAR "No Swing" port hole fitting is designed to cut costs and installation time.

It consists of a stem and body with a floating nut. Tightening the nut forces the stem into the seat making a leak-proof seal.

Since the fitting body does not turn when the nut is tightened, the fitting can be used in even the most confined spaces. Also fittings can be positioned perfectly without fear of leakage.

Easy Installation

1. Drill ordinary pilot hole.
2. Form sealing step with inexpensive step drill or standard counter-bore.
3. Tap for straight threads.
4. Use ordinary wrench to install fitting.



Can Be Adapted To Existing Pipe Thread Ports

Better Than A Pipe Thread Fitting:

1. Tees & Elbows can be accurately aligned with tube run.
2. Fitting can be removed without touching adjacent fittings.
3. Provides positive metal-to-metal seal . . . threads do not form the seal.
4. Can be resealed time after time without leakage.

Better Than An "O" Ring Fitting:

1. "No-Swing" fittings cost substantially less.
2. Won't leak under high pressure or severe vibration.
3. No precision hole preparation or special tooling required.
4. Will not deteriorate from pressure, temperature or corrosive fluids.

IMMEDIATE DELIVERY FROM LOCAL STOCKS — All standard shapes and sizes from ⅛" to 2".

Copyright 1959 by Flodar Corporation.

FLODAR Corporation

16911 ST. CLAIR AVENUE • CLEVELAND 10, OHIO • IV 6-2200

*Circle **61** on Time-Saver Card*

Circle **153** on Time-Saver Card

"A.N.D." and "M.S." HYDRAULIC CONTOUR CUTTERS in stock

A.N.D. 10050 internal

Economy series; integral plain pilot

Turret lathe and drill press series; integral carbide reamer pilot

Heavy duty series; replaceable carbide reamer or plain pilot, carbide and HSS

MS33656, MS33657, MS33514, and MS33515 O.D. flat form tools

Carbide tipped High speed steel

MS33514 internal

Solid carbide, carbide tipped, high speed steel models

MS16142 internal S.A.E.

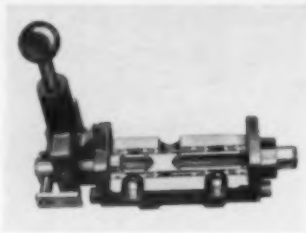
Carbide tipped; plain or reamer pilot

Write for sizes and prices.

SONNET Tool and Mfg. Co.
580 North Prairie Avenue, Hawthorne, California

NEW PRODUCTS

either screwed or flanged pipe connections. Direct hand operation



or choice of remote controls, including solenoid, hand-operated air or hydraulic pilot valves. Cast in 88-10-2 bronze or steel for working pressures to 2000 psi.

Homestead Valve Mfg. Co.
Coraopolis, Pa.
Circle **320** on Time-Saver Card

RADIAL AIR MOTOR . . . has 5 cylinders

Designation: Pistonair
Features: High starting torque and sustained load-lugging ability with simple throttle valve control allows instant starts, stops, unlimited reversibility and variable speeds. Operates safely in explosive, damp, hot or corrosive atmospheres. No harm from repeated overloads or stalls.
Specifications: Hp ratings from 11½ to 20 at 90 psi. Direct drive models turn at 400 to 800 rpm at rated hp with stall torques from 225 to 162 ft. lbs. Five gear reduction ratios from 4.1:1 to 21.5:1. output shaft rpm at rated hp ranges from 19 to 200 with stall torques of 4837 to 648 ft. lbs.

Joy Mfg. Co.
Pittsburgh, Pa.
Circle **321** on Time-Saver Card

AIR CYLINDER . . . with integral valves

Features: Combines air power cylinder, electrically-actuated control valve, built-in speed controls. Installation requires only one air

Continued on page 156

NEW Portable Flow Meter

PATENTS APPLIED FOR

Checks Circuit Efficiency

One meter serves many circuits, is unaffected by viscosity change, and requires no piping

Operators of hydraulic circuits containing Tell-Tale® Filters can now *know* the exact degree of efficiency of their hydraulic components by checking flow rates periodically with the new Tell-Tale Flow Meter. The flow rate may be determined at those points in the circuit where Tell-Tale filters are installed (including pressure line filters to 5000 psi). In use, the meter utilizes the filter housing by replacing the filter cartridge. In only a few minutes flow rates are accurately determined under various conditions (i.e. under load and under no load to check pump slippage). No piping work or component removal is needed and the meter reads directly in gallons-per-minute. No conversion tables are necessary because readings are correct regardless of fluid temperatures or viscosities.

To the already impressive advantages of standardizing on Tell-Tale Filters (knowing *when* to clean the filter, easy access to filter cartridge, and positive protection against pump starvation) is now added the ability to know *when* and *where* there is leakage in the circuit. Tell-Tale Fluid Meters are available in five maximum capacities, from 10 to 200 gpm. Meter housings are also available for permanent installations. Write today for more information.

Above: Tell-Tale Flow Meter being placed into Tell-Tale Filter housing (mounted in suction line) to check pump slippage.

Below: Highly accurate, this meter operates like no other, on a variable-orifice, precise pressure-drop principle. In operating, the orifice (pointed out, below left) in the end of the piston is closed down until the flow is restricted enough to create a predetermined pressure drop that moves the piston forward. Movement is indicated by the when-to-clean pointer on the filter housing. Flow rate is then read from the graduated control wheel, in gallons per minute.

The ROSAEN COMPANY
1776 EAST NINE MILE ROAD • HAZEL PARK, MICHIGAN

Distributed nationally for immediate delivery—
The Complete Line of

ALEMITE SURGEPRUF

reusable hydraulic hose and couplings

The quality line for original equipment . . . the preferred line for fast, easy on-the-job replacements! Let Surgepruf be your one dependable source of hose, couplings and components for every industrial and automotive application! High-pressure, medium-high pressure and low-pressure hose for temperature operating range of −40° to +275°F. Couplings are reusable. Complete range of hose sizes and couplings, as well as adapters and swivel adapters. One of Alemite's 34 strategically located distributors is ready to give you prompt, complete service!

Medium-High and High-Pressure Hydraulic Hose and Fittings. Single and double wire braid hose. Non-skive feature assures easy assemblies in seconds. Seamless inner tube of Buna-N rubber and Neoprene outer cover. Resists abrasion, weather and oil. High strength reusable couplings. No special tools required.

New Low-Pressure "Shur-Lock" Hose—for use on fuel, filter, oil, air and vacuum gauge lines. Rugged, precision-matched couplings. Leak-proof grip. General purpose hose and coupling utility kit eliminates need for large inventory.

Replacement or Display Kit No. 2208

Permits fast, easy on-the-spot assemblies for most common low-pressure automotive applications.

Replacement or Display Kit No. 2209

For low pressure fleet, automotive and industrial general purpose use.

Replacement or Display Kit No. 2207

A complete selection of reusable couplings, adapters and swivel union adapters for most medium-high pressure industrial and farm equipment hydraulic lines.

Write today for Surgepruf Catalogs!

Dept. EE-59, 1850 Diversey Parkway, Chicago 14, Illinois

Symbol of SW Excellence

ALEMITE
DIVISION
STEWART-WARNER
CORPORATION

NEW PRODUCTS

line connection and simplified wiring to solenoid-actuated, pilot-operated valve. Square head cylinder has rust-proof body, and induction case hardened piston rod with hard chromium plated finish. Control valve in reciprocating disc design. Easily adjusted speed controls built into 4-way valve port plate provide accurate adjustment of cylinder piston speed in both directions.

Specifications: In five bore sizes and choice of stroke length.

Hannifin Co.
Des Plaines, Ill.

Circle **322** *on Time-Saver Card*

ELECTRICAL CONDUIT . . . features pliability

Designation: Kopex

Features: Composed of layers of continuous metal, allows top protection for cables, can easily be set and bent to negotiate corners and curves. Pressure sealed to prevent ingress of oil and water. Remains rigid after bending and can be shaped to any radius without distorting bore. Easily cut by hand. Seal-tight end fitting. Produced in continuous lengths, or minimum 100-ft. coils.

Specifications: In standard electrical sizes from ½ to 1¼". Available with PVC outer covering for protection against corrosion. Made in formations of ductile materials and combinations of materials such as stainless steel, aluminum, copper, and paper.

Kopex Division
Gemmer Mfg. Co.
Detroit, Mich.

Circle **323** *on Time-Saver Card*

BHEW

Hydraulic Cylinders

- Basic Designs
- Specific Adaptations
- Superior Quality
- Application Engineering

BHEW SINGLE-ACTING GENERAL-PURPOSE CYLINDERS (1500 PSI PISTON STYLE SERIES) are designed around standard components but custom-built to suit *your* application. They're available in a variety of mountings (pin eye is standard) with adjustable or non-adjustable rod ends, with or without rod ends.

• Self-adjusting "U" cup seal on pistons • Self-adjusting rod wipers • Honed steel barrel, high-tensile, hard chrome-plated rod ends • Packings available for extreme high and low temperatures and most non-inflammable fluids.

Production parts save you money, do the job better! BHEW basic cylinders can easily be modified to fit your *specific* product applications. You benefit from production economies; you get custom-built cylinders.

Let's discuss your design and application problems —

FREE!

Write today for Hydraulic Cylinder Engineering Reference data — 78 dimensional basic designs for general-purpose and special-purpose double-acting and single-acting cylinders. SAVE TIME.

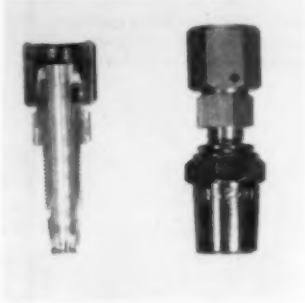
BENTON HARBOR ENGINEERING WORKS, INC.
622 Langley Avenue St. Joseph, Michigan

Circle **24** *on Time-Saver Card*

SWIVEL FITTING . . . for air lines

Designation: H-52

Features: New method of making swivel connections for pneumatic and hydraulic air lines by attaching two pieces with stainless steel wire inserted in swivel head. Insures absolute leak proof and vibration proof swivel fitting. Increases strength of fiitting.



Specifications: For use on hose with i.d. ranging from 3/16 to 3/8" and o.d. hose sizes from 3/8 to 3/4". Swivels are all nickel and chrome plated.

Hofman Engineering Co.
Chicago, Ill.

Circle **324** *on Time-Saver Card*

Continued on page 158

7th Annual Competition

1959 FLUID POWER PRIZE PAPER CONTEST

Articles about:
HYDRAULIC AND PNEUMATIC SYSTEMS AND COMPONENTS

DESIGN • APPLICATION • MAINTENANCE

FIRST PRIZE	$500
SECOND PRIZE	$300
THIRD PRIZE	$200
4th to 7th PRIZES, EACH	$100

All prize papers will be published in APPLIED HYDRAULICS & PNEUMATICS Magazine. Papers receiving honorable mention awards will also be published during 1960 and paid for at regular rates.

CONTEST CLOSES JULY 1, 1959

Committee of Judges:

S. H. Durbin, Associate Chief Engineer, E. W. Bliss Company
O. S. Perkins, Engineer-In-Charge, Hydraulic Crane Division, Bucyrus-Erie Co.
C. H. Cannon, Mechanical Systems Engineer, Lockheed Aircraft Corp.

SPONSORED BY APPLIED **Hydraulics & Pneumatics**

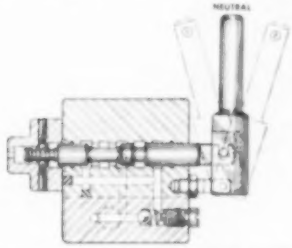
An Industrial Publishing Corporation Magazine
812 HURON ROAD, CLEVELAND 15, OHIO

To Receive A Contest Rules Booklet Circle 240 On Time-Saver Card

new 10,000 psi FOUR-WAY VALVES

effortless operation for applications up to 10,000 psi

Have valving problems on hydraulic applications calling for high pressures up to 10,000 psi? This new GREENLEE Four-Way Valve may be your answer. Simple, trouble-free spool-type valve . . . completely balanced to provide effortless operation at any pressure in any position. It operates with the same ease at 10,000 psi as at 0 psi. Panel mounted for universal adaptability. Subplate available. Precision-made, precision-tested. (Max. leakage 4 cu. in. per minute at 10,000 psi.) Write today for illustrated data sheet.



GREENLEE Four-Way Valve is available in two models: No. 1717 (above) with detent-positioned control lever . . . No. 1704 with spring-centered control lever.

THE GREENLEE LINE ALSO INCLUDES A WIDE SELECTION OF HAND AND POWER-OPERATED HYDRAULIC PUMPS

GREENLEE

GREENLEE TOOL CO.

1776 Columbia Ave., Rockford, Illinois

Circle **72** *on Time-Saver Card*

NEW PRODUCTS

MONEL GLASS INDICATORS . . . give visible check

Designation: Visi-Flo
Features: Gives visible check on direction, rate of flow, viscosity, color, clarity, and purity of product. Can be used with hydraulic fluids. Protects against line stoppage.
Specifications: In ¼ through 2" sizes in style 444; ¾ through 4" sizes in styles 40 and 44. Suitable for 125 psi and temperatures to 250 F.

OPW-Jordan
Jordan Corp.
Cincinnati, Ohio
Circle **325** *on Time-Saver Card*

CONTROL VALVES . . . are split-body

Features: For use in high-temperature, high-pressure control applications. Have large-flow capacities and face-to-face dimensions based

on ISA standards, which permits interchangeability of split-body line. All major components within line are of unitized construction making possible development of 432 different valve combinations from single split-body. Inventories kept to minimum.

Kieley & Mueller, Inc.
Middletown, N. Y.
Circle **326** *on Time-Saver Card*

AIR COMPRESSOR . . . reduced in size

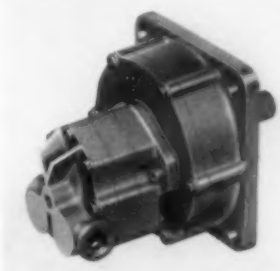
Designation: ER-6
Features: May be used as stationary unit or mounted on skid-frame as semi-portable. Has extreme degree of balance. Requires little space. Most air, oil, water pipes are housed inside compressor case, reducing installation space requirements. Intercooler draws only 560 gallons of 60 F water an hour. Has lubricating system which requires oil replenishment every 3 weeks.

Specifications: Delivers 1075 cfpm at 100 psi. Weighs 6600 lbs. Uses Swedish steel in drop-forging crankshaft and connecting rods, nodular iron for compressor cross-heads and hollow pistons. Valve casts and guards made of heat-treated nodular cast iron.

Atlas Copco Eastern, Inc.
Paramus, N. J.
Circle **327** *on Time-Saver Card*

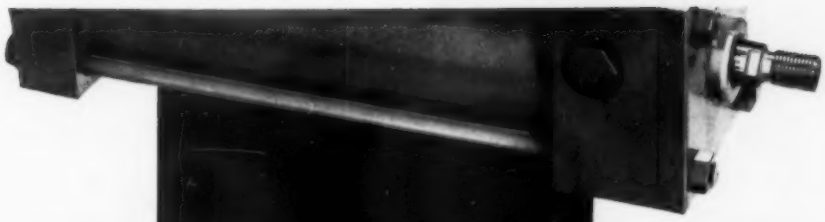
HYDRAULIC MOTOR . . . has integral gear reducer

Features: Consists of gear type fluid motor mounted as part of a planetary gear reducer. For welding or heat treating fixtures, powering hoists, turning turrets and platforms, driving elevators, conveyors, and earth augers. High reduction ratio assures smooth output even at lowest shaft speeds. Designed to provide 150-foot-lbs. of output torque when used with oil source capable of 1500 psi.



Specifications: Overall dimensions about 8x8" and unit projects 7½" from mounting surface.

Webster Electric Co.
Racine, Wisc.
Circle **328** *on Time-Saver Card*
Continued on page 160



1

2

3

here's a 3-POINT PROGRAM for lower cylinder costs

Cut inventory costs

to a minimum by taking advantage of fast deliveries from Hydro-Line factory stocks. Over 90% of all cylinder applications fall into the thousands of bore, stroke and cushion combinations ready for immediate shipment. Series R2 cylinders rated at 200 psi air and 500-2500 psi hydraulic; Series S2 cylinders rated at 200 psi air and 1000 psi hydraulic; Series N cylinders rated at 2000 psi and higher.

Pare maintenance costs

by taking advantage of the cylinders that not only require fewer downtime periods in every class of service, but also are faster and easier to service on the job without special tools or equipment.

Save 42-1/2% by specifying R2 Series

Specifying this design instead of high-pressure hydraulic cylinders will give you these, or even greater, savings. You can save even more by specifying stock cylinders. By choosing Hydro-Line you can eliminate specials on almost all jobs. All three series — R2, N, and S2 — meet J I C specifications.

Just fill in the coupon below to get bulletins containing more data or contact your nearby Hydro-Line representative.

act now!

Please send me additional data on the classes of Hydro-Line cylinders checked below, including complete information on deliveries from factory stocks:

( ) Series R2 (heavy-duty air, medium-duty hydraulic, industry standard)
( ) Series N (heavy-duty hydraulic, industry standard)
( ) Series S2 (automotive industry automation standards)

Name and Title _____
Company _____
City _____ State _____

HYDRO-LINE MANUFACTURING COMPANY
5601 PIKE ROAD ROCKFORD, ILLINOIS

HYDRO-LINE CYLINDERS

5601 PIKE ROAD • ROCKFORD, ILLINOIS

manufacturers of: high- and low-pressure hydraulic cylinders • heavy-duty air cylinders • adjustable-stroke cylinders • dispensing cylinders • intensifiers • single-acting cylinders • booster cylinders

ADAMS FACT FILE #2

PLANT AIR

Moisture Chief Cause of Trouble . . .

Every company today is looking for ways to offset the increased costs of labor, material, equipment and services. At a gasoline station you expect "Free Air", but in industry it is a major expense. Perhaps in your own plant, for an investment in a few minor compressed air system alterations, significant savings are possible.

Water, sludge, rust, oil and dirt in compressed air systems are prime causes of maintenance and production down-time. Water vapor condensing in air lines tends to corrode the piping. Also, water present in the piping may freeze during winter, causing serious reduction of compressed air supply. Such restrictions are often difficult to locate and thaw. This same line moisture may emulsify lube oil destroying its lubricating value and the resultant mixture has high fouling characteristics. Frequently, ice will form within the tool itself since expanding air cools the moisture . . . tool efficiency will be seriously affected.

Some of the Other Problems Created By Wet Compressed Air . . .

Wet compressed air is not only a construction and production tool problem. Faulty paint jobs, contaminated chemical and food products can often be traced to moisture laden compressed air. Waterhammer, unequal pipeline thermal expansion and line leaks also result from collected moisture. In addition, air lost through traps, and in blow-down of compressed air lines provide no useful work . . . represent a sizeable power loss.

You Can Lick Compressed Air Moisture Problem . . .

All of these hidden costs can be virtually eliminated by the installation of an Adams Aftercooler and Cyclone Separator between the compressor and receiver tank. By cooling discharge air to within 10° F. of cooling water temperature — guaranteed with Adams standard Aftercoolers — the moisture can be removed at the separator. Pressure loss is less than one-half pound on these units including the separator. In severe cases, moisture removal of over 90 per cent can be obtained by cooling the air with Adams 2° Aftercooler to within 2° F. of water temperature.

Air Filter for Final Protection at Point of Use . . .

As an added safeguard for expensive tools and equipment, an Adams Poro-Stone Air Filter should be installed just before the air is used. These filters remove all solid material picked up by the air stream. With an Adams Aftercooler, Cyclone Separator and Air Filters clean, dry, trouble-free air is supplied to your production tools. You get continuous service with minimum maintenance.

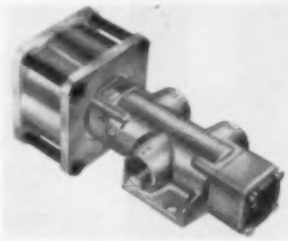
For further information on how the complete line of Adams air equipment can solve your compressed air problems, write today for your free copy of Bulletin No. 712 on Aftercoolers and Bulletin No. 117 on Poro-Stone Air Filters from the R. P. Adams Company, Inc., 249 East Park Drive, Buffalo 17, New York.

Circle **3** *on Time-Saver Card*

NEW PRODUCTS

DIAPHRAGM VALVE . . . for low pressures

Features: To meet demand for low pilot pressure actuator in field of instrumentation and automation. Anti-extrusion arrangement of all



kinetic O-ring seals for leakproofness after millions of cycles of operation. Threaded ports and flow direction marked for easy installation.

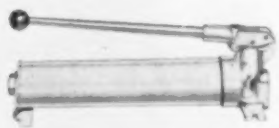
Specifications: Actuated by pilot pressures as low as 5 psi on double diaphragm types, and to 10 psi on standard spring return models. In either sideport bodies or for manifold mounting, in sizes from ⅛ through 1" NPT in 2, 3, 4, and 5-way types. For pressures from partial vacuum to 500 psig.

Versa Products Co., Inc.
Brooklyn, N.Y.

Circle **329** *on Time-Saver Card*

HYDRAULIC PUMP . . . provides 10,000 psi

Features: Manually-operated, 2-speed, changes speed and pressure automatically. Provides top pressure of 10,000 psi at start of pull. After gear, wheel or bearing is broken loose, speed increases and pressure drops. Fingertip control valve assures instant release or pumping action.



Specifications: Outlet is ⅜" female pipe thread base. Has oil capacity of 140 cu. in.

Owatonna Tool Co.
Owatonna, Minn.

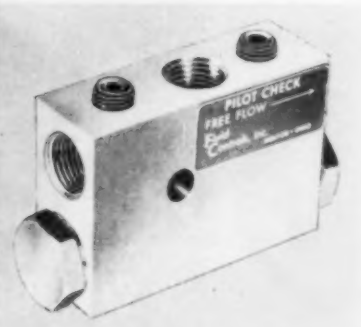
Circle **330** *on Time-Saver Card*

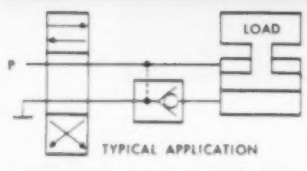
Continued on page 162

Positively Lock Circuits Or Cylinders . . . until released

PILOT CHECK VALVES

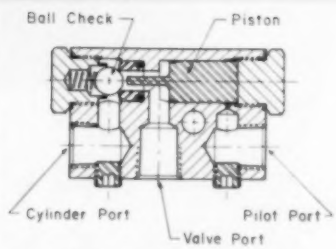
- For clamping or holding circuits
- Allows use of inexpensive control valves
- Long trouble-free service





- St'd Ports—¼" and ⅜" pipe (NPTF)
- For oil to 3000 psi

Write for detailed information



Fluid Controls, inc.

Member of National Fluid Power Association

Manufacturers of Hydraulic Valves and Devices

Relief Valves • Check Valves • Restrictor Valves
Needle Valves • Pilot Check Valves • Special Valves
Pressure Compensated Flow Regulators

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Circle **100** on Time-Saver Card

KUNKLE GAUGES

FOR PROCESS & POWER INSTRUMENTATION

KUNKLE GAUGES

Complete, broad range line makes gauge application-specification easy with assured results backed by 50 years of gauge manufacturing experience.

Ranges from 15 p.s.i., or 30" of vacuum, to 20,000 p.s.i.

Bourdon tubes of bronze, drawn or bored s/s, and other alloys

YOUR COPY SHOWING NEW GAUGES AND SPEC. DATA NOW AVAILABLE WRITE:

By the makers of dependable Kunkle Valves

KUNKLE VALVE CO. • FT. WAYNE, IND.

1, 2, or 3-spool VALVE

MODEL WP

PARALLEL VALVE *for heavy duty industrial mobile hydraulic applications*

GRESEN HYDRAULICS

Capacity: **40** GPM at 20 ft./sec.

MAX. PRESSURE: 1500 PSI

Features: **SPOOLS** – fully balanced, self centering, accurately feathered for fine metering action – separate ball checks for each spool.

CARTRIDGE type relief valve has hardened seat.

TRIPOD mounting feet for easy installation.

CHOICE of many modifications.

WRITE FOR LITERATURE

GRESEN *Mfg. Co.*

405 35th Ave. N.E., Minneapolis 8, Minn.

Circle **74** on Time-Saver Card

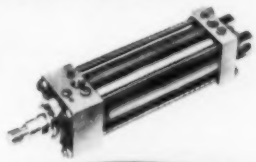
WHO'S SMILING?

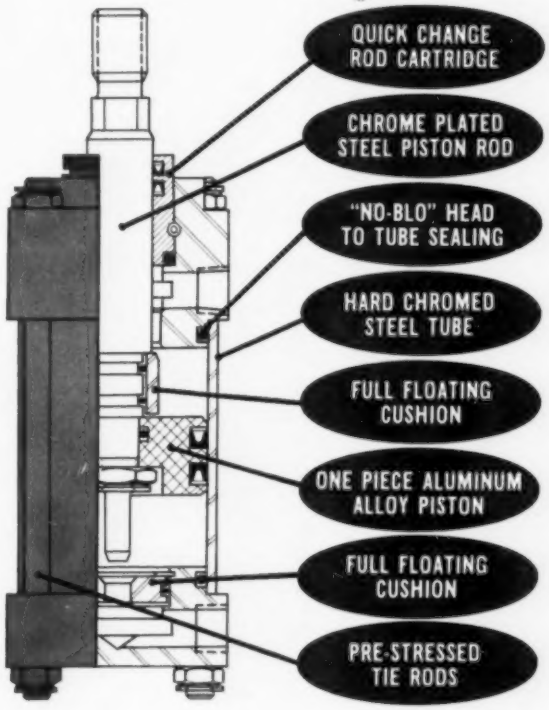
YOU, WHEN **YOU** DISCOVER THE DESIGN ADVANTAGES OF • • • •

LINDBERG

SQUAREHEAD CYLINDERS

DESIGN IN LINDBERG AND . . . ADD ALL THESE FEATURES! and many more besides!




QUICK CHANGE ROD CARTRIDGE
CHROME PLATED STEEL PISTON ROD
"NO-BLO" HEAD TO TUBE SEALING
HARD CHROMED STEEL TUBE
FULL FLOATING CUSHION
ONE PIECE ALUMINUM ALLOY PISTON
FULL FLOATING CUSHION
PRE-STRESSED TIE RODS

CERTAINLY! Your choice of mounting styles • 7 bore sizes to 6" • Built to JIC recommendations • Standardized mounting dimensions.

WANT TO SMILE AGAIN!

FOR DETAILS OF THESE AND MANY OTHER FEATURES, WRITE FOR THESE BULLETINS TODAY.

SQUAREHEAD "S" LINE—	BULLETIN S-101
2000 PSI "H" LINE—	BULLETIN H-101
HEAVY DUTY "A" LINE—	BULLETIN A-101

for fast action on "specials" tell us what you need.

LINDBERG AIR and HYDRAULIC DIV.

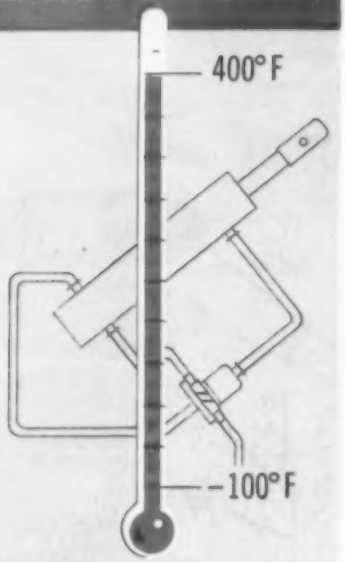
TEER-WICKWIRE & CO.

1802 WILDWOOD AVE. • JACKSON, MICHIGAN

Circle **158** on Time-Saver Card

Bendix
in Southern California

NEEDS HYDRAULIC DESIGNERS



One of the major programs at Bendix-Pacific is the long range development of high precision hydraulic controls for missiles and aircraft. We are seeking creative engineers familiar with high temperature requirements who are interested in pioneering the new frontiers.

Bendix-Pacific is one of the largest and best equipped sources for hydraulics in the nation. You are sincerely invited to consider joining this forward looking company where you can enjoy all the advantages of Southern California living.

Please mail the coupon or write today.

W. C. Walker, Engineering Employment Mgr.
Pacific Division, Bendix Aviation Corp.
11600 Sherman Way, North Hollywood, Calif.

I am interested in hydraulic engineering.
I am a graduate engineer with _____ degree.
I am not a graduate engineer but have _____ years experience.

Name _____

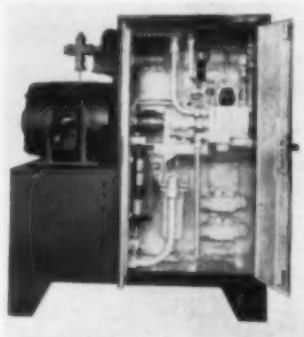
Address _____

City _____ Zone ____ State _____

NEW PRODUCTS

POWER UNIT
. . . is console model

Features: All important components sealed in dust-tight cabinet. A 15 hp., totally-enclosed motor



installed alongside to allow ventilation. Main components mounted on a drilled manifold with all pipe connections on outside. Reservoir and hydraulic operated pump in cabinet. Valves have oil-immersed solenoids. Filter maintains cleanliness in system down to 40 microns.

J. N. Fauver Co., Inc.
Detroit, Michigan
Circle **331** *on Time-Saver Card*

USE A TIME-SAVER CARD FOR MORE INFORMATION ON

- ADVERTISED PRODUCTS
- NEW COMPONENTS
- USEFUL LITERATURE

CONTROL VALVE
. . . gives positive control

Designation: No. 234-L

Features: Two-way air control valve used with lifts, hoists. Provides positive control, quick response, and top safety. With or without hold-open feature for locking lever in intake or exhaust position.

Specification: Size ½".

OPW-Jordan
Cincinnati, Ohio
Circle **332** *on Time-Saver Card*

Lovejoy

Flexible Couplings

from .003 to 4250 H.P.
⅛ In. to over 9½ In. Bores

- **Can be installed in minutes**
- **Align with a straight edge—no gauges required**

The most trouble-free couplings you can install on your equipment . . . no complicated mechanisms, all parts open for inspection, reversible cushions, no lubrication required. Immediate delivery from stock in any quantity.

Send us your requirements for quick recommendations and prices. Ask about our helpful Flexible Coupling Guide Sheet and request Catalog C-56.

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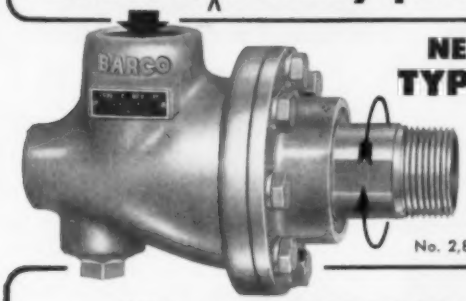
Circle **106** *on Time-Saver Card*

Circle **17** on Time-Saver Card

Need a Better rotary joint?



NEW TYPE C

Patent No. 2,836,439

—it's BARCO!

For countless applications, Barco's new Type C Rotary Joint will give you the best operating records you've ever had—*and for LESS COST!*

"CRACK-FREE" CHROME PLATED SLEEVE—A standard Barco feature. Minimizes corrosion, friction, wear. Stainless steel spring also standard.

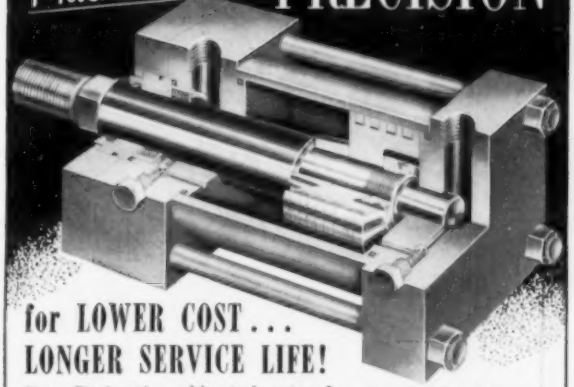
RESISTS SEAL RING BREAKAGE—The spherical seal ring is under compression, not *tension*, loading. Self-adjusting for wear. Seal withstands shock loads and alternating hot and cold service.

WIDE SPACED BEARINGS—Two, instead of one . . . increased bearing area. No lubrication required. Lowest friction.

200 P. S. I. STEAM RATING—Heavy duty service at *no extra cost.* Eight sizes, ½" to 3". *Send for new Catalog 310 today.* **BARCO MANUFACTURING CO., 532F Hough Street, Barrington, Illinois.**

Circle **149** on Time-Saver Card

Machine Tool PRECISION



for LOWER COST . . . LONGER SERVICE LIFE!

From Cincinnati, machine tool center of the world, SHEFFER brings you Air and Hydraulic Cylinders of advanced design . . . sturdy, compact, accessible . . . made with *machine tool precision* for lower cost and longer trouble-free life. Here is THE single source of supply for ALL your cylinder requirements . . . the industry's MOST COMPLETE line. Write for cataloging today!

- Seven Standard Series — 16 Mountings.
- Standard Bore Sizes — 1⅛" thru 14".
- Special Bore Sizes to 30" — Strokes to 26 ft.
- Operating Pressures 150 psi Air to 5000 psi Hydraulic.
- Boosters — Air to Hydraulic; Hydraulic to Hydraulic; Standard and Reciprocating; Ratios up 100 to 1; up to 50,000 psi.
- Hand Operated Hydraulic Pumps.
- Meet or exceed JIC.

THE SHEFFER® CORPORATION

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NFPA NATIONAL FLUID POWER ASSOCIATION

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SEE PHONE BOOK YELLOW PAGES

THE COMPLETE PACKING UNIT for Hydraulic or Pneumatic rods and cylinders

MON-O-PAK® CARTRIDGE

- Easily and quickly installed.
- No adjusting necessary.
- Equipped with Anti-Backlash rings.
- Includes Seal-Guard® rod wiper.
- Low friction coefficient.
- Shock and burst proof.
- Reduces initial machining cost.
- Gives longer service life.
- Cuts machine down-time.
- Easily removed for replacement.

Write for catalog and prices.

HYDRAULIC ACCESSORIES CO.
24301 Hoover Road, Warren Mich.

Circle **87** on Time-Saver Card

HYDRAULIC ENGINEERING FOR INDUSTRY

CARDWELL
TRADEMARK SINCE 1829

DESIGN SERVICES
FABRICATION
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HYDRAULIC PANELS
ELECTRICAL CONTROL PANELS
ACCUMULATORS
STOCKING DISTRIBUTORS HYDRAULIC COMPONENTS

Complete Engineering and Design Services Are Available. Qualified Sales and Service Engineers in Most Areas.

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Quality A CARDWELL TRADITION SINCE 1829
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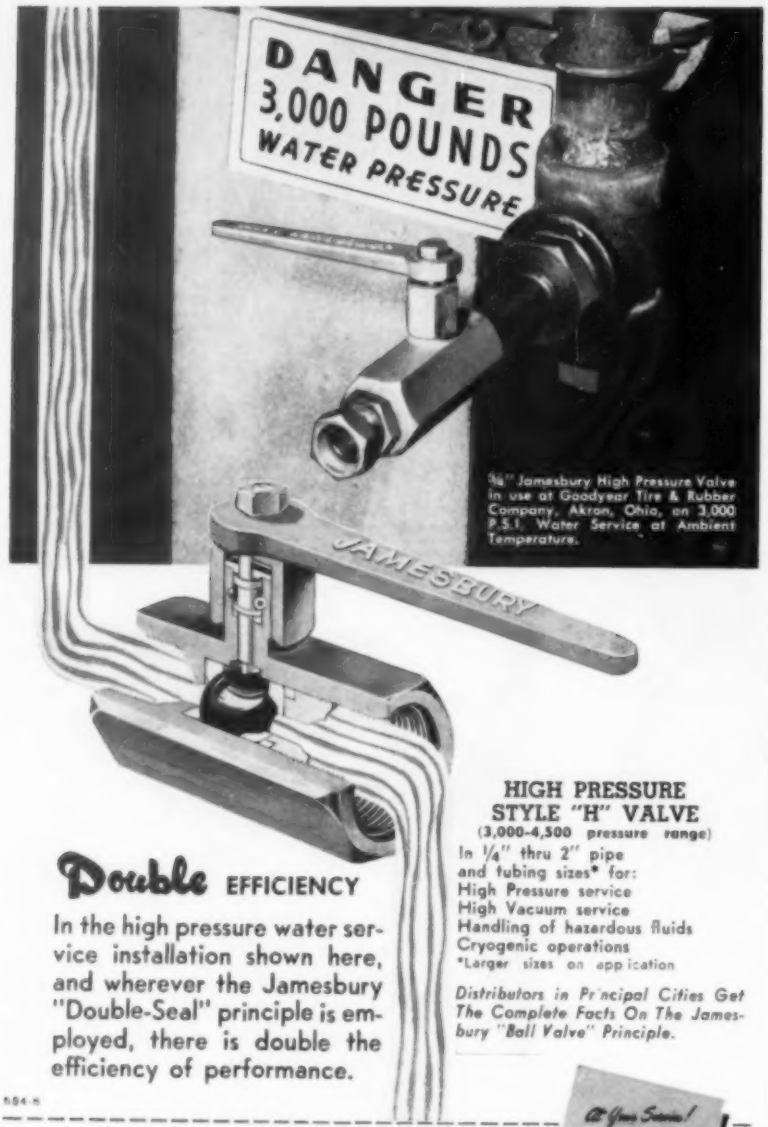
Circle **30** on Time-Saver Card

jamesbury
Double-Value
"Double-Seal"™ Ball Valves



¾" Jamesbury High Pressure Valve in use at Goodyear Tire & Rubber Company, Akron, Ohio, on 3,000 P.S.I. Water Service at Ambient Temperature.

Double EFFICIENCY

In the high pressure water service installation shown here, and wherever the Jamesbury "Double-Seal" principle is employed, there is double the efficiency of performance.

HIGH PRESSURE STYLE "H" VALVE
(3,000-4,500 pressure range)

In ¼" thru 2" pipe and tubing sizes* for:
High Pressure service
High Vacuum service
Handling of hazardous fluids
Cryogenic operations
*Larger sizes on application

Distributors in Principal Cities Get The Complete Facts On The Jamesbury "Ball Valve" Principle.

584-S

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Company _____

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☐ Jamesbury Literature
☐ Distributor Service

JAMESBURY CORP., 85 NEW STREET, WORCESTER, MASS.

Circle **93** on Time-Saver Card

USEFUL LITERATURE

AIR FILTER

Removes oil vapor from compressed air and gas lines, in addition to water, particles. Shows visibly when filter elements are exhausted and when to drain water. Model specifications in table form. Ample photos show use and tests. Price list included. *Beach Sta-Dri Filter Co., Los Angeles, Calif.*

Circle **411** on Time-Saver Card

28-VOLT DC MOTOR

Has integral cooling fan and gear reduction. Brushes easily accessible and long lasting. Fills need of rugged, lightweight power unit. Unit produces 2.0 hp at 3000 rpm. Bulletin illustrates outline dimensions of Model D-820 and gives performance curve. *Hoover Electric Co., Los Angeles, Calif.*

Circle **412** on Time-Saver Card

RELIEF VALVES

Four new catalog sheets contain revisions on differential piston-type relief valves, handling pressures from 100 to 500 psi. Complete dimensional information. Pressure vs. flow characteristics for various sizes and models. Sizes ¼, ⅜, ½ and ¾ inches. *Fluid Controls, Mentor, Ohio.*

Circle **413** on Time-Saver Card

DYNA-CHUTE

An electric hydraulic control that raises, holds, or lowers discharge chutes on ready-mix trucks. Four-page folder shows application of unit with photographs, descriptions. *Monarch Road Machinery Co., Grand Rapids, Mich.*

Circle **414** on Time-Saver Card

OIL-FREE COMPRESSORS

Features vertical design, reducing carbon ring wear. Model WGO-9 is single cylinder, single stage, double-acting, water-cooled. Designed for 24-hour service, requires only a simple, block foundation on small floor area. Bulletin

Continued on page 166

Circle **37** on Time-Saver Card

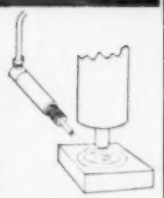
QUALITY DIE CLEANING at LOWER COST!

NEW HOLLOW SHAFT

SPRING RETURN • STUD MOUNT • 9/16" or 3/8" BORE

Clippard Minimatic TRADE MARK

AIR CYLINDERS



Having dirty die trouble? New Clippard HOLLOW SHAFT Spring Return MINIATURE AIR CYLINDERS can solve your problem quickly . . . inexpensively . . . and be used to lubricate dies at the same time!

In punch press diagram at right, CLIPPARD HOLLOW SHAFT cylinder is cycled to extend into bottom die on up stroke, blasting stream of air and mist of lubricant through hollow shaft. This kicks out chips and work piece and lubricates die for next punch. On down stroke of press, cylinder shaft retracts for clearance.

In automated circuitry and semi-automated work positions, the uses of Clippard MINIATURE Air Valves, Cylinders, Valve Solenoids, Accessories and Fittings are unlimited. Quality is high. Prices are reasonable. Send for complete literature on Clippard MINIMATICS, today.

Write NOW for NEW Bulletin MA ⟹

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Manufacturers of Miniature Pneumatic Devices, R.F. Coils, Electronic Equipment

When the design calls for an indicating gauge, specify the best—
MARSH
New catalog covers gauges for every need
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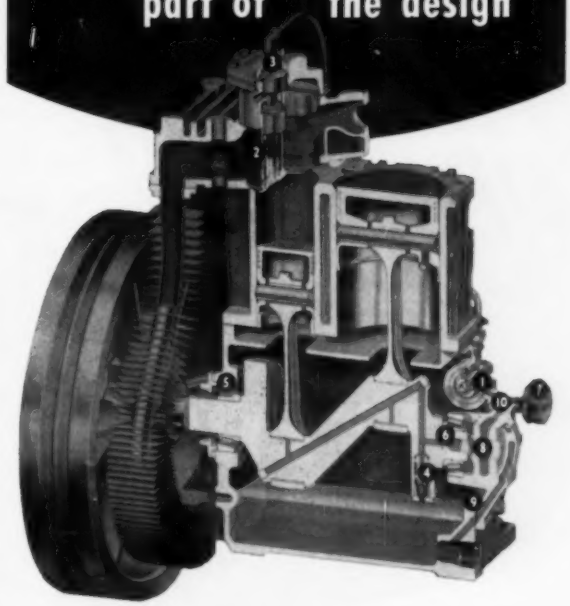
3501 Howard Street, Skokie, Ill.

Circle **108** on Time-Saver Card

WHEN COMPRESSED AIR IS PART OF THE PRODUCT

make **QUINCY** compressors part of the design



1. Simple hydraulic unloader valve.
2. Low-lift, high pressure intake valve.
3. Diaphragm and unloader assembly.
4. Centrifugal-closing oil spill valve on crankshaft.
5 - 6. Oversize Timken roller bearings.
7. Easy reading oil pressure gauge.
8. Discharge oil passage in bearing carrier.
9. Intake oil passage (crankcase to pump).
10. Passage to hydraulic unloader valve.

This is the open picture of Quincy's exclusive Safe-Q-Lube System, the most advanced pressure oiling and loadless starting system available in a compressor. Safe-Q-Lube is another outstanding Quincy engineering feature that adds long-lasting, trouble-free compressor service to your designs.

MAIL TODAY

Quincy COMPRESSOR CO. Dept. AH-559 Quincy, Illinois

Please send free catalog of industrial air compressors and detailed literature about Safe-Q-Lube.

NAME

FIRM

ADDRESS

CITY ZONE STATE

Circle **136** on Time-Saver Card

USEFUL LITERATURE

A-44. In 12 pages is data on 14 sizes, ranging from 95.6 to 939 cfm. Also part-designated section drawings, installation and product photos, special section on T-Block design compression ring. *Joy Mfg. Co., Pittsburgh, Pa.*

Circle **415** on Time-Saver Card

TUBE FITTINGS

Hydraulic, pneumatic, and vacuum catalog with flow charts, JIC piping. Complete data on O-ring seal tube fittings, flare fittings, pipe fittings, tube benders. *Lenz Co., Dayton, Ohio.*

Circle **420** on Time-Saver Card

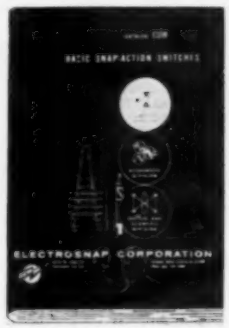
AIR HOISTS

Features improved design with welded steel frame construction with longer and larger machine-grooved drum. Operated on compressed air 80 to 100 psi. Available in capacities from ¼ to 12½ tons. Four-page Bulletin 861 gives dimension table, diagrams, product photos and page of specifications. *Detroit Hoist and Machine Co., Detroit, Mich.*

Circle **421** on Time-Saver Card

SWITCH REFERENCE

Catalog on basic switches and actuators contains complete definition of terms used in industry plus photos, specifications, dimensional drawings, and modification



information on four types of switches and actuators. Pocket for price lists, quotations included in 52-page book. Supplementary technical literature to be issued periodically to fill in late data. Catalog ES-59. *Electrosnap Corp., Chicago, Ill.*

Circle **416** on Time-Saver Card

SERVO ACTUATOR

For accurate positional control without intricate mechanisms. Can be operated remotely by cable, rod, or linkage. Not affected by temperature, either extremes of heat or cold, or contaminated fluid, Nine models described in leaflet. *Hydraulics & Pneumatics Ltd., Wolverhampton, England.*

Circle **417** on Time-Saver Card

FILTRATION CART

Filters fluids to 2-5 micron cleanliness for use in hydraulically operated devices. Completely self-contained, portable. Accommodates 55- gal. drum, has certified contamination level, stainless steel components. Bulletin 1381 gives specifications, methods of operation, construction, filter network contents. *George L. Nankervis Co., Detroit, Mich.*

Circle **418** on Time-Saver Card

Continued on page 168

Capital

HYDRAULIC FILTERS

for Hydraulic and Oil Re-circulating Machinery

Capital Hydraulic Filter Units are smaller than ordinary filters but with filtering capacity equal or superior to many larger filters. Small size permits greater latitude in design, particularly where space is restricted.

Capital Filter Units are designed with one-piece construction — no screws or nuts to work loose and be lost or mislaid. Simple and easy to clean by any method.

Made from specially designed woven Monel wire, with narrow corrugations presenting the greatest filtering area. Monel support supplies extra sturdiness.

Capital Filter Units are made in 4 Types:

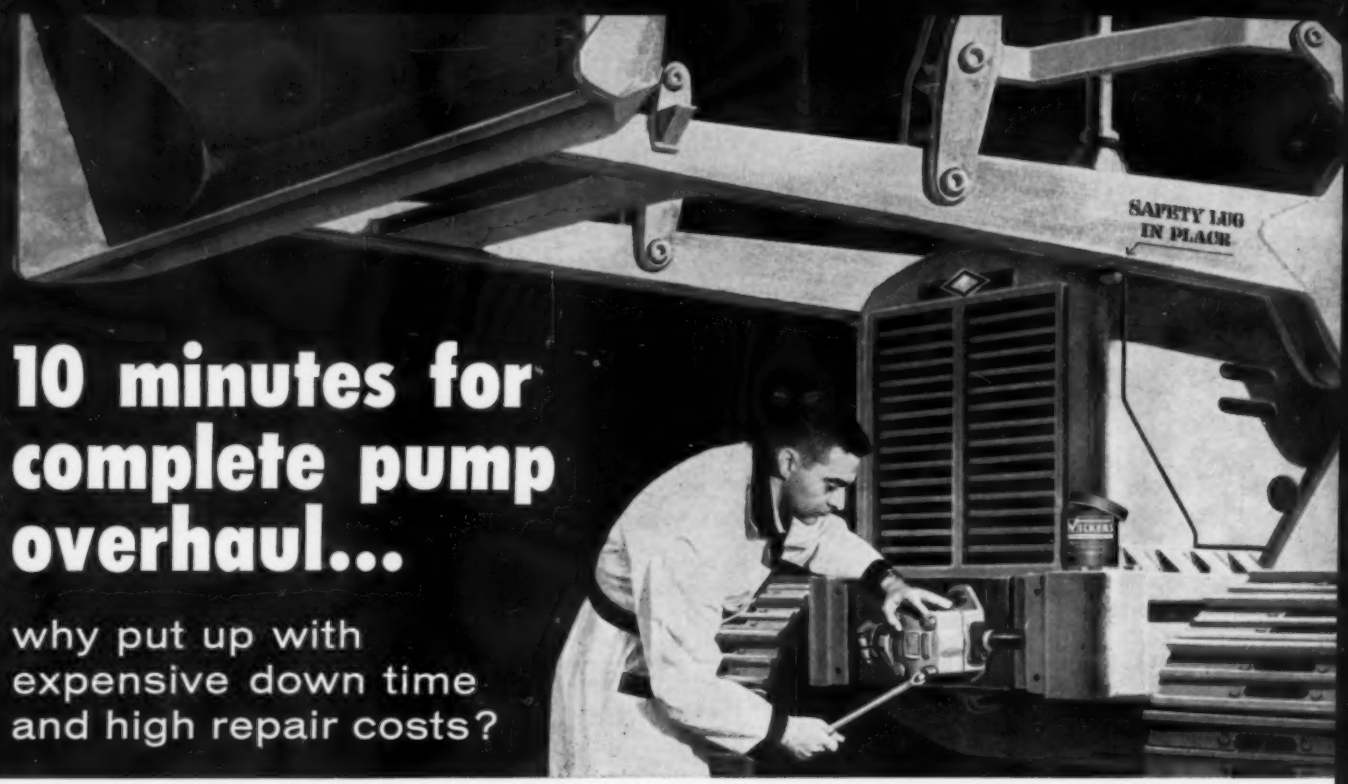
- MONO-BILT 60 Mesh All Stainless Steel (Sump type).
- MONO-BILT Standard All Stainless Steel
- MONO-ECONO Mono-Bilt with Monel Metal Insert and Cadmium Plated Top and Bottom.
- LINE TYPE with Aluminum Housing and Mono-Bilt, one Piece Filter Unit.

Built from Monel Metal they are impervious to rust and corrosion.

CAPITAL ENGINEERING & MFG. CORP.

5836 SOUTH ASHLAND AVENUE, CHICAGO 36, ILLINOIS

Circle **29** on Time-Saver Card



10 minutes for complete pump overhaul...

why put up with expensive down time and high repair costs?

on the spot
maintenance with

VICKERS®

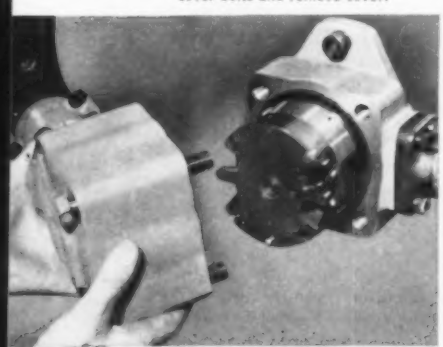
"High Performance" Pumps*
keeps your jobs on schedule
*PATS. & PATS. PENDING

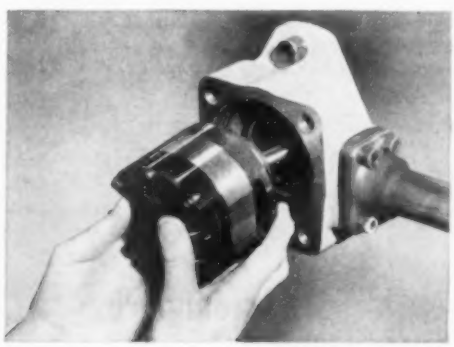
Without removing the pump from the vehicle, and without disconnecting hydraulic lines, the new Vickers "High Performance" pump can be completely overhauled by simply inserting a new pumping cartridge. The pumping cartridge contains all wearing parts in one replaceable unit and results in new pump performance. Write for Bulletin No. M5108 for performance characteristics.

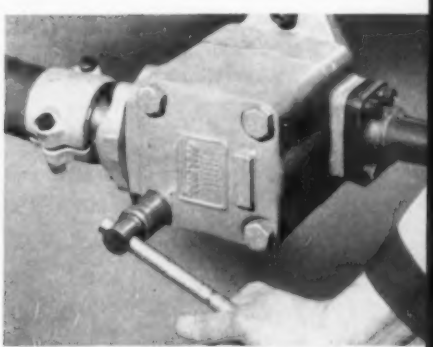
1. After safety, cleanliness and draining instructions have been followed per vehicle manufacturer's recommendations, take out four cover bolts and remove cover.

2. Take out old pump cartridge and insert new one. The cartridge includes cam ring, rotor, vanes, etc. —all parts in one assembly.

3. Replace cover and you have the equivalent of a new pump ready for long, trouble-free service.







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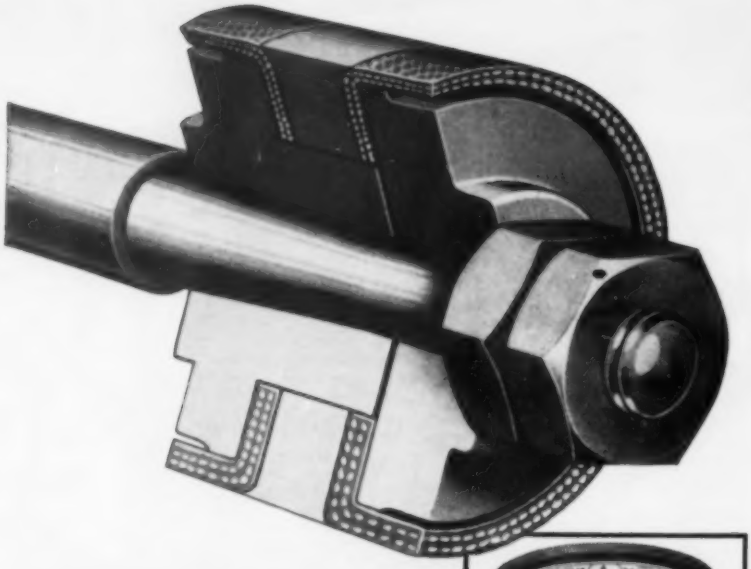
VICKERS INCORPORATED
DIVISION OF SPERRY RAND CORPORATION
Mobile Hydraulics Division
ADMINISTRATIVE and ENGINEERING CENTER
Department 1474 • Detroit 32, Michigan

Application Engineering Offices: • ATLANTA • CHICAGO • CINCINNATI CLEVELAND • DETROIT • GRAND RAPIDS • HOUSTON • LOS ANGELES AREA (El Segundo) • MINNEAPOLIS • NEW YORK AREA (Springfield, N.J.) PHILADELPHIA AREA (Media) • PITTSBURGH AREA (Mt. Lebanon) PORTLAND, ORE. • ROCHESTER • SAN FRANCISCO AREA (Berkeley) SEATTLE • ST. LOUIS • TULSA
ALSO SOLD AND SERVICED IN AUSTRALIA, ENGLAND, GERMANY & JAPAN
IN CANADA: Vickers-Sperry of Canada, Ltd., Toronto, Montreal & Vancouver

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

Circle **169** *on Time-Saver Card*



WHY PUMCUPS MAKE A DIFFERENCE

Darcova Pumcup

Darcova 45° Bevel Type Pumcup

- in reciprocating pumps
- in air and hydraulic cylinders

With Darcova Pumcups in your cylinders, there's less fluid slippage. High volumetric efficiency is maintained and Pumcups outlast other packings at least 3 to 1! There's less down-time! Lower power cost! Smoother operation! Less maintenance and replacement!

Longer life is the result of truly advanced cup engineering, including 100% nylon composition, plus a choice of types, textures and precision sizes to exactly match fluid, cylinder, pressure and temperature conditions.

These same factors contribute to prolonged high efficiency by permitting full advantage of the "cup principle". Thus fluid pressure always keeps Pumcups snug against cylinder wall, despite eventual wear, while the total frictional load is minimized.

Send for Bulletin 5503. It will give you *all* the facts.

DARLING VALVE & MANUFACTURING CO.
Williamsport 15, Pa.

DARCOVA — THE ORIGINAL COMPOSITION CUP

TRADE MARK PUMCUPS

Circle **43** on Time-Saver Card

USEFUL LITERATURE

PLASTIPS

Designed to aid engineers specifying Teflon for applications. This monthly sheet offers facts, recommendations on plastics usage in close-tolerance applications, fabrication and performance of precisions plastics components. *Tri-Point Plastics, Inc., Albertson, L. I., N. Y.*

Circle **422** on Time-Saver Card

FORGED FITTINGS

Both stainless and alloy steel. Catalog shows all models, specifications, dimensions, weights. Drawings and photos. Tables and charts. Eight-page Bulletin S-1-57. *H. K. Porter Co., Inc., Roselle, N. J.*

Circle **423** on Time-Saver Card

SEALS

Brochure describes facilities for producing custom-made rubber parts, seals, and components. Laboratory facilities for developing natural, synthetic and silicone compounds, fabricating techniques, and photographs of representative products and services. Names, addresses of factory sales reps included. Eight pages in file folder form. *Goshen Rubber Co., Goshen, Ind.*

Circle **419** on Time-Saver Card

2-WAY AIR VALVES

Combine air intake and exhaust. Hold-open type and without hold-open feature, both in ½" size. Product photos, ratings given in 2-page Bulletin F-44. *OPW-Jordan, Cincinnati, Ohio.*

Circle **424** on Time-Saver Card

CYLINDERS

Air and hydraulic cylinders and related products illustrated in 2-color, 16-page brochure. Product and application photos, dimension tables, part-designated section drawings, and product descriptions with exploded photos. Methods for ordering explained. Representative list includes addresses, phone numbers. *Petch Mfg. Co., Alpena, Mich.*

Circle **425** on Time-Saver Card

Continued on page 170

Circle **95**➡

Consistently uniform J&L special smooth I.D. tubing is used by Hein-Werner for jacks ranging in size from 1½ to 8 tons.

J&L special smooth I.D. cylinder tubing speeds production of Hein-Werner hydraulic jacks

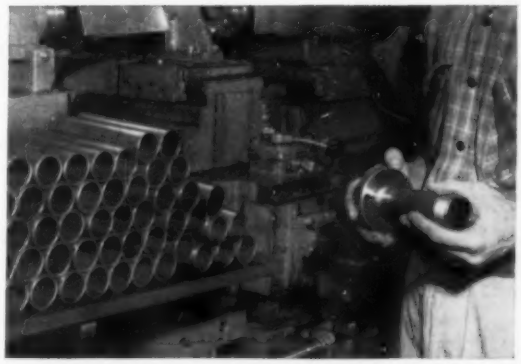
"We use J&L cylinder tubing because its superior inside finish requires no machining, and that means less cost to us," says Morris L. Lumb, purchasing agent for the famous Hein-Werner Corporation of Waukesha, Wisconsin. "We've found through experience that the wall thickness of J&L tubing is consistently uniform, order after order. It's a good product, the kind we need for hydraulic jacks that will carry the Hein-Werner name."

Hein-Werner purchases J&L tubing in 20-foot lengths, then cuts them to size and bevels both ends in a single operation. After both ends are V-threaded, no further processing is required. *The costly inside honing operation has been eliminated completely.*

J&L tubing is now used by Hein-Werner for jacks ranging in size from 1½ tons to eight tons. Pressures developed go as high as 10,000 psi.

If your firm makes a product requiring steel tubing with special smooth I.D., investigate J&L cylinder tubing. Its use will often permit substantial cost reductions. For more information, call your J&L representative. Or write to Jones & Laughlin Steel Corp., 3 Gateway Center, Pittsburgh 30, Pennsylvania.

Special inside smoothness of J&L tubing eliminates costly honing operations



Precise O.D. tolerance of J&L Electricweld tubing provides easier threading, more secure joining for this Hein-Werner cylinder component.

STEEL

Jones & Laughlin Steel Corporation

PITTSBURGH, PENNSYLVANIA

Circle **9** on Time-Saver Card

free catalog

47-page catalog illustrating complete line of
AIR CYLINDERS,
AIR VALVES,
AIR CLAMPS,
DIAL FEED TABLES

WRITE BEFORE NEXT TUESDAY

ALLENAIR

The cylinder of "distinction" shown above is a Factory Reject. Only straight rods available.

ALLENAIR CORP. AH-5
225 East 2nd Street, Mineola, N. Y.
Name .....
Company .....
Address .....
City ..... Zone ... State

USEFUL LITERATURE

PRESSURE GAGE

For all high pressure applications. Wrapped tube smothers explosive action. Safety features are: removable armor plate dial-backing, solid back; blow-out plugs, and safety glass lens. In broad range of types, sizes, capacities, materials listed in 48-page catalog. *Kunkle Valve Co., Fort Wayne, Ind.*

Circle **426** on Time-Saver Card

CARBON-GRAPHITE

Karak—molded under high unit pressures, up to 20 T per sq. in., from mixture of graphite and forms of carbon, then furnaced to 5500 F. Uses versatile—fluid coupling seals, pump block seals, packing rings. Withstands heat to 750 F in oxidizing atmosphere, 6000 F in controlled atmosphere. Many other characteristics, including transverse strength of 3500 to more than 14,000 psi. Graphs show hardness and weight strength, thermal conductivity. *The Ohio Carbon Co., Cleveland, Ohio.*

Circle **427** on Time-Saver Card

AIR CONTROL VALVES

Pilot-operated single and double solenoid. Combines rugged construction, compact design, zero leakage, and full ½" flow. Two and 3-position designs. Two, 3, 4-way, including neutral, compound-on, and compound-exhaust actions. Bulletin 58-A lists sizes, dimensions, model numbers. *Hunt Valve Co., Salem, Ohio.*

Circle **428** on Time-Saver Card

AIR MOTOR JACK

For industrial and construction applications. Data provided on all models for 20, 35, 50, and 100-ton capacities in performance chart. Many product photos, cutaway drawings. Six-page Bulletin 435-IJ. *The Joyce-Cridland Co., Dayton, Ohio.*

Circle **429** on Time-Saver Card

BRIGGS MANUAL TELLS HOW TO BOOST PRODUCTION ON BIG JOBS

WRITE FOR FACTS YOU CAN USE.

Here is one of many cases where Briggs "know-how" is producing. On this, world's largest stretch press, four Briggs units are connected in parallel, taking full flow of booster pump (60-65 GPM) with about 8 PSI differential. Steady operation. Smooth delivery. Write for your free copy of Briggs HYDRAULIC MANUAL. See how you can apply tested facts to your own operation.

Showing world's largest stretch press. Douglas Long Beach Plant.

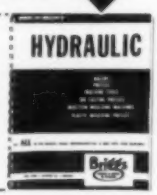
PRODUCT OF BOMSER RESEARCH

Briggs
PIONEERS IN MODERN OIL FILTRATION

HYDRAULIC FLUID FILTERS • OIL FILTERS

- **FILTER/SEPARATORS**
- **COMPRESSED AIR/GAS LINE**
- **FILTERS • REPLACEMENT CARTRIDGES**

The Briggs Filtration Company, Dept. 295, Washington 16, D.C.
YES! Send me the manual illustrated.
Name .....
Address .....
Company .....



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REPRINTS

The following reprints of special reports which have appeared in APPLIED HYDRAULICS & PNEUMATICS Magazine are available:

WHAT YOU CAN GET IN ELECTRO-HYDRAULIC SERVO VALVES . . . By Wayne Kinney and Phillip Weiss

A special report showing a wide variety of electrohydraulic servo valves. Includes an article of how contamination affects servo valve design.

WHAT TO LOOK FOR IN AIR VALVES . . . By Allan E. Morris

This 16-page report contains basic designs of directional control, pressure control and flow control valves. Illustrates many different designs and points to remember in selecting a specific design.

Single copies 50¢; over 50 copies, 35¢ ea.

Send all orders—enclosing the exact amount in coins or check—to: APPLIED HYDRAULICS & PNEUMATICS, 812 Huron Road, Cleveland 15, Ohio.

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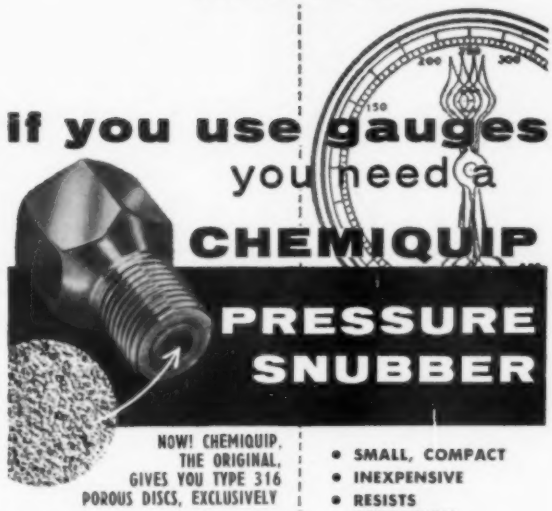


if you use gauges you need a CHEMIQUIP PRESSURE SNUBBER

NOW! CHEMIQUIP, THE ORIGINAL, GIVES YOU TYPE 316 POROUS DISCS, EXCLUSIVELY

- SMALL, COMPACT
- INEXPENSIVE
- RESISTS CORROSION
- EASILY CLEANED
- NO MOVING PARTS
- CONFORMS WITH U.S. NAVAL SPEC. MIL-D-2940

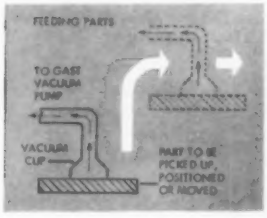
What they do: Chemiquip pressure snubbers give steady average pressure reading—smooth out pressure impulses and fluctuations—eliminate pressure gauge failure due to shock—remove harmful solids from actuating fluids. Available in ⅛", ¼" and ½" NPT.

Popular uses: dampening pulsations and surges: for mercury manometers, meteri g, and filtering small quantities of liquids or gases.

AVAILABLE IN STAINLESS STEEL BRASS, DURAL OR MONEL

Write today for illustrated fully-detailed Bulletin BW-741

CHEMIQUIP CO. 36 East 10th St., N. Y. 3 GRamercy 7-3772



NEW

Gast Booklet ready to give you

"APPLICATION IDEAS"

on uses of air motors, compressors, vacuum pumps

Looking for new ways to improve methods—save time—or cut costs? This booklet may be valuable to you! With line drawings, it shows dozens of the basic principles of "putting air to work".

With photographs of our customers' products—from air mixers to data plotters—it illustrates each principle. . .and shows how Gast rotary Air Motors, Compressors and Vacuum Pumps provide advantages as original equipment or in plant use.

Design Engineer or Plant Master Mechanic, you'll find this booklet of interest. . .and it may "spark" an important idea you can use!

WRITE TODAY FOR NEW "APPLICATION IDEAS" BOOKLET!

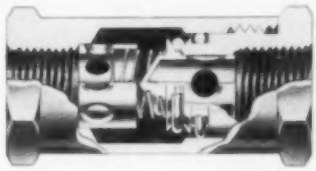
Gast Manufacturing Corp.
P.O. Box 117-D
Benton Harbor, Mich.

GAST ROTARY
"Air may be your answer!"

- AIR MOTORS TO 7 H.P.
- COMPRESSORS TO 30 P.S.I.
- VACUUM PUMPS TO 28 IN.

Circle **69** on Time-Saver Card

you can be **POSITIVE...** **with Circle Seal CHECK VALVES**



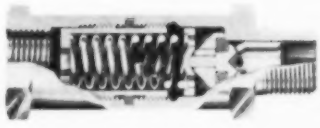
200 Series for virtually any liquid or gas service...0-3000 psi...100 Series for ultra-sensitive service...2300 Series for high pressure service.

POSITIVE SEALING at any differential pressure...Quick opening, POSITIVE CLOSING (seals dead tight even with opening pressures as low as .5 psi)...POSITIVE PERFORMANCE with no chatter or hammer, maintenance-free dependability... POSITIVE MAXIMUM FLOW with minimum pressure loss.

Wherever perfect sealing is required, proven reliability of Circle Seal precision valves provides the one complete answer—a combination of absolute leak-proof sealing when closed and virtually maintenance-free operation.

Circle Seal

you can be **POSITIVE...** **with Circle Seal RELIEF VALVES**



5100 Series for virtually any liquid or gas service...10-1000 psi...500 Series for low pressure service... 5-160 psi.

POSITIVE, DEAD TIGHT SEALING up to more than 95% of set cracking pressure...POSITIVE MAXIMUM FLOW with ports fully exposed when valve starts to open ...POSITIVE RESEATING within 5% of cracking pressure, zero leakage at or close to reseat pressure ...POSITIVE PERFORMANCE with chatter and squeal eliminated ...with special in-line design for ease of mounting...and interchangeable springs to provide wide range of cracking pressures.

Complete engineering data available. Write today!

CIRCLE SEAL PRODUCTS COMPANY, INC.
2181 East Foothill Boulevard
Pasadena, California

◎ See our Catalog in Sweet's Product Design File

Circle Seal

Circle **36** on Time-Saver Card

New Disc Design
GIVES YOU GREATER FILTERING AREA!

RIPLEY SUMP STRAINER

GPM	Filter Area
5	61 sq. in.
8	92 sq. in.
10	122 sq. in.
20	218 sq. in.
30	311 sq. in.
50	370 sq. in.
75	471 sq. in.

You'll find Ripley Strainers provide long, low-cost, trouble-free protection for your hydraulic equipment. Their self-cleansing discs have no crevices to clog or reduce flow—are assembled in standard combinations to give you *maximum* filtering area in *any* rated size! Available in sump and line models to meet your exact requirements. Send for complete information today!

RIPLEY LINE STRAINER

GPM	Filter Area
5	61 sq. in.
8	92 sq. in.
10	122 sq. in.
20	218 sq. in.

35 years of experience in the manufacture of screens and strainers.

Ripley MANUFACTURING CO.
Filter Division
32749 Northwestern Highway • Farmington, Michigan

Filter Division
RIPLEY MANUFACTURING CO.
32749 Northwestern Highway, Farmington, Mich.
Gentlemen: Please send me complete information on your new disc type Sump and Line Strainers.
☐ Name of nearest stocking distributor.

Name_____
Title_____
Company_____
Address_____
City_____ Zone_____ State_____

Circle **140** on Time-Saver Card

POST SCRIPTS OF INDUSTRY

News about people, manufacturers and sales organizations

Rose new Marsh president

Rose

A. D. Rose, formerly executive v. pres., was elected president of the Jas. P. Marsh Corp., Skokie, Ill., at a recent meeting of the board of directors. Starting in 1918, Rose worked up through the sales department. In the 1920's, he organized the company's first engineering and development department. Rose was named vice president and assistant general manager in 1942.

Chosen chief engineer at Hydrodyne

Chosen as chief engineer for Hydrodyne Corp., Los Angeles, is Paul P. Duron. He was chief design engineer for Permanent Filter Corp., and helped organize Turbocraft, Inc. Duron will be in charge of all Hydrodyne engineering, as well as Skinner Seal and Skinner Filter Divisions.

Hunt elected deputy chairman of Dowty Group

Hunt

Robert F. Hunt has been elected deputy chairman of the Dowty Group Ltd., Cheltenham, England. Hunt started as an apprentice in 1935 with Dowty and, during the war, worked with the R.A.F. Technical Training Command as a chief instructor in combat aircraft hydraulics. After the war, Hunt was appointed v. pres. and general manager of the Dowty Equipment of Canada Ltd., becoming president in 1953. Hunt maintained this post when, in 1956, he returned to headquarters in England to become director of the Group.

Hardin transferred to L. A.

Robert A. Hardin was recently transferred to the Los Angeles area by Denison Engineering Division of Columbus, Ohio. Hardin, a sales engineer for the pump and controls division, is from the Houston branch office. He joined Denison in 1954.

S-P names Sutherland as new sales manager

Sutherland

Richard E. Sutherland has been chosen sales manager of the S-P Mfg. Corp., Solon, Ohio. A Case graduate, Sutherland joined the company two years ago from The Weatherhead Co. His new post will include direct sales of power chucks, air and hydraulic cylinders, valves and accessories.

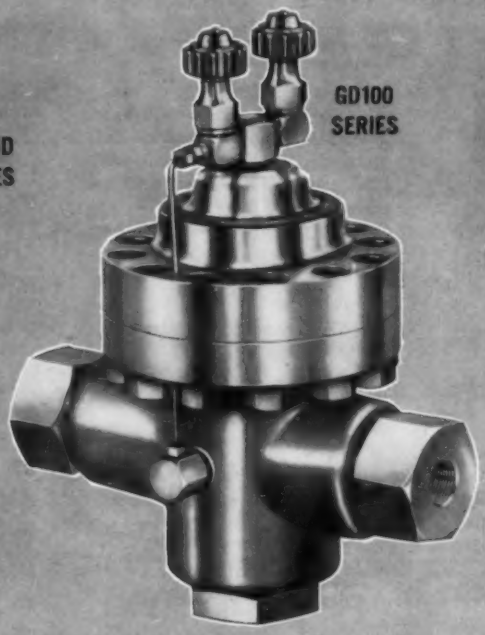
Imperial Brass selects three sales managers

Three new divisional sales managers have been appointed by The Imperial Brass Mfg. Co., Chicago. T. A. Fuite, formerly Chicago sales representative, now heads the Central Division; J. A. Norris, formerly in Los Angeles, now heads the Western Division, and H. W. Pearson, previously in Texas and Louisiana, is now chief of the Southern Division.

Continued on page 174

Circle **171**➡

GD60 AND 80 SERIES



GD100 SERIES

LR20B SERIES

Control gases safely, accurately

TO 15,000 PSI AND 50,000 SCFM WITH VICTOR REGULATORS

You get precise regulation of high pressure gases with large flow rates, because Victor employs gas pressure to control the regulating diaphragm. The result is accurate delivery from 5 to 15,000 psi with inlet pressures to 15,000 psi . . . plus ability to obtain flows in excess of 50,000 scfm at maximum inlet and outlet pressures. Chart below shows operating range of standard models.

MODEL NO.	MAX. INLET PSI	MAX. OUTLET PSI	FEATURES	MAX. FLOW SCFM
GD10	3,600	500	Single adjustment regulator control	250
GD30	2,500	2,500	Load & bleed valve control	400
GD31	3,600	3,600	Load & bleed valve control	600
GD61C	2,500	2,500	Load & bleed valve control	170
GD62C	3,600	3,600	Load & bleed valve control	200
GD65	6,000	6,000	Load & bleed valve control	250
GD65C	7,000	7,000	Load & bleed valve control	250
GD80A	5,000	5,000	Load & bleed valve control	500
GD81A	10,000	10,000	Load & bleed valve control	800
GD86R	10,000	10,000	For remote control only	1,200
GD100R	6,000	6,000	For remote control only	20,000
GD100	6,000	6,000	Load & bleed valve control	20,000
GD200	6,000	6,000	Load & bleed valve control	50,000
GD700	7,000	7,000	Single adjustment regulator control; self relieving	250
SR10	3,600	1,000	Small, spring loaded regulator	4
LR20B	7,000	7,000	Spring loaded regulator; self relieving	2
LR20BSS	10,000	10,000	Spring loaded, stainless steel	2
LV10	7,000	7,000	Loader valve control	15
BPR10	7,000	7,000	Back pressure regulator	2

Operating temperature range: −67 F. to + 250 F.

. . . Yours for the asking Take advantage of Victor's long experience with high pressure gas regulation to help solve your special problems involving flow rates, delivery pressures, corrosive fluids and temperature compensation. Write, wire or phone us today. No obligation.

All models listed are field proved. Most are designed for panel mounting or remote control. They regulate all non corrosive gases, including oxygen. Stainless steel models available for corrosive gases and pressures above 10,000 psi. For complete specifications, write for Victor High Pressure Regulator sheets.

VICTOR® for regulators

VICTOR EQUIPMENT COMPANY MISSILE DIVISION 57

Mfrs. of High Pressure and Large Volume Gas Regulators; welding & cutting equipment; hardfacing rods; blasting nozzles; cobalt & tungsten castings; straight-line and shape cutting machines.

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J. C. Menzies & Co., Wholly-Owned Subsidiary

POST SCRIPTS OF INDUSTRY

Teree named v. pres. of engineering at Republic

B. R. Teree is the new v. pres. of engineering at Republic Mfg. Co., Cleveland, Ohio. Until recently, Teree was v. pres. of engineering and manufacturing for Greer Hydraulics, Inc.

General Filters official retires

Robert G. Gregory, v. pres. of engineering for General Filters, Inc., Novi, Mich., has announced his retirement. He joined the company in 1937, and will be retained in an advisory capacity by the company. Gregory plans to make his home in Florida.

North American selects Matteson

R. J. Matteson has been made Eastern District Manager for the Hydraulic Controls Division, North American Manufacturing Co., Cleveland, Ohio. Matteson, who formerly held a managerial job with the Askania Regulator Co., will make his headquarters in Plainfield, N. J.

Two new managers appointed by Vickers Inc.

Vickers Inc., of Detroit named two new managers recently. Jacques Carpenter, formerly district manager at Worcester, Mass., takes over the Detroit Industrial Sales office in the same capacity. Carpenter, with the company since 1941, has

Carpenter

Lane

spent the last 15 years in sales.

New Commercial Markets Development Manager is A. M. Lane, a veteran of 19 years with Vickers. Lane, most recently general sales manager of Mobile Hydraulics Division, has held various sales and engineering assignments.

Vall appointed manager

William J. Vall has been appointed manager of Quality Control and Traffic of Hydreco Division, The New York Air Brake Co., Kalamazoo, Mich. Vall, with Hydreco since 1951, was most recently purchasing and traffic manager. Dallas Betzer, assistant purchasing manager, succeeds Vall.

Koehler moves up at Westinghouse Air

Koehler

Richard H. Koehler has been appointed general sales manager of the Le Roi Division of Westinghouse Air Brake Co., Milwaukee. He moves from the Pittsburgh staff where he was advertising and publicity director. Koehler joined the company in 1952 as sales promotion manager.

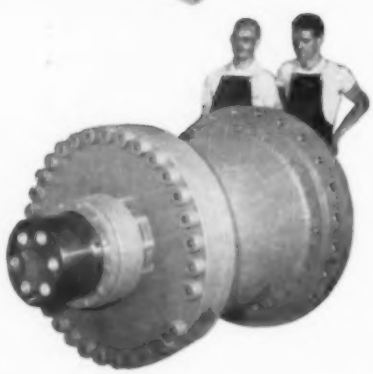
Continued on page 176

Lincoln AIR AND HYDRAULIC **Cylinders**

The answer to the increased demand for rugged, heavy duty air and hydraulic cylinders. Designed for the hardest usage in Steel Mill operation or for the hundreds of other modern cylinder applications that require dependable efficient service.

HYDRAULIC RAM
166" Stroke—10"
Stainless Steel Rod
1000 PSI Oil Pressure
For Aluminum Ingot Units
On D. C. Casting Units

WRITE FOR NEW COMPLETE CATALOG



HYDRAULIC CYLINDER
32" Bore—24" Stroke
2000 PSI Oil Pressure
Lifting Capacity Equals
1,000,000 lbs.
For Oil Shale Retorts.

JACK CYLINDERS
For Mining Operation
10" Bore—140" Stroke
2000 PSI Oil Pressure

Lincoln MACHINE CO. INC.

P. O. Box 272 EDgewood 2-4689 Salem, Ohio

Circle **103** *on Time-Saver Card*

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When it's a Question of

"O" RINGS in any material or special compound for every service condition required.

PACKINGS to your specifications in leather, synthetics, asbestos, teflon, etc.

Also gaskets and washers in over 200 materials . . .

Look for the Answer at Auburn . . .

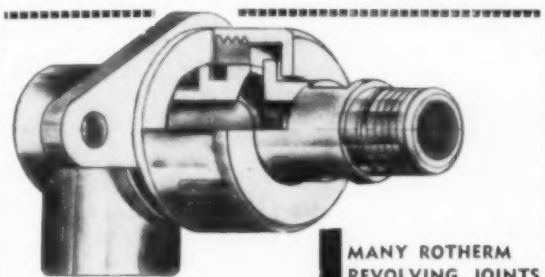
Send us your specifications or blueprints. You'll receive prompt quotations and recommendations without obligation

THE AUBURN MANUFACTURING CO.
308 Stack St., Middletown, Conn.

New York, N. Y.; Rochester, N. Y.; Detroit, Mich.; Chicago, Ill.; Minneapolis, Minn.; Pittsburgh, Pa.; Cincinnati, Ohio; Ridgewood, N. J.; Atlanta, Ga.; Memphis, Tenn.; St. Louis, Mo.; Washington, D. C.

CONDITIONS TOO SEVERE FOR ORDINARY REVOLVING JOINTS?

AIR-STEAM-VACUUM-HYDRAULIC-OXYGEN
WITH AS MANY AS 4 PASSAGES

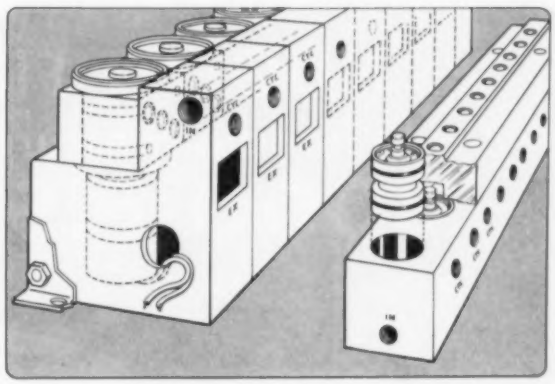


MANY ROTHERM REVOLVING JOINTS OPERATING UNDER THE FOLLOWING CONDITIONS

- STEAM PRESSURE 150# AT 5000 R.P.M.
- HYDRAULIC PRESSURE 5000# AT 900 R.P.M.
- PROOF OF PERFORMANCE AT 10,000 HOURS
- LET US SOLVE YOUR JOINT PROBLEMS

ROTHERM ENGINEERING CO., INC.
7280H DEVON AVE. CHICAGO 31, ILL.

Circle **146** on Time-Saver Card

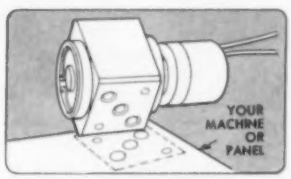


New Humphrey "Stack-Pack" Electric Manifold Valve. May be used singly or in multiples. Valve mechanism easily removed from manifold. Single inlet port for multiple installations.

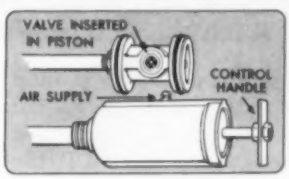
Humphrey Exclusive! Manifold using Insert Valves. Just the internal mechanism of valve may be inserted in your manifold. Manual, cam or pilot operated.

HUMPHREY "Quick-Dump" VALVES

give you greater capacity—smaller size—faster action—more versatility and simplicity of design



This may be the valve you need! Square bodied Electropact or piloted valve with all porting on one side to mate with drilled air* passages in your product, or—mount on panel with all porting on one side. Greatly simplifies installation.



For original equipment, "Quick-Dump" Valves offer outstanding advantages. This customer's air cylinder is operated by two Humphrey Valves inserted in piston itself! A turn or pull of handle controls piston travel.

OFFERED IN THESE BASIC TYPES—

ACTUATED BY ANY OF THESE METHODS—

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⅛" delivers 30 CFM at 100 PSI • ¼" delivers 80 CFM at 100 PSI • ½" delivers 275 CFM at 100 PSI • Dead seal shut-off. Temperatures from -65° to 225° F. 2-3-4 way—⅛", ¼", ½" sizes. Write for engineering assistance on your valving problems.

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DIVISION OF GENERAL GAS LIGHT COMPANY "The Heart of Automation"
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Pneumatic-Hydraulic Valves and Devices

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This NUGENT FILTER will handle pressures to 3000 P.S.I.

Fig. 1555CP-0 Filter Fig. 1555E-0 Cartridge

Here's big news from the pioneer of fluid filtration. The Nugent Co. introduces the latest addition to their line of fine products . . . a completely new series of Laminated Fiber Disc Filters. Designated as 1555CP, they are designed for hydraulic and other high pressure applications.

Constructed for 3000 psi working pressure, they comply with the requirements of the ASME Code for Unfired Pressure Vessels. API or ASME code inspection and stamping is available.

Five sizes are available with capacities ranging from 1.5 GPM at 3 psi pressure drop to 47.6 GPM at 6 psi pressure drop when filtering 100 SSU viscosity mineral oil. For installations requiring larger capacity, the filters may be connected in multiple. Inlet, outlet and drain are located in the bottom of the filter.

For complete information on 1555CP filters, write today . . . or if your job is *RUSH,* phone ORchard 4-8121, Skokie, Illinois. Our engineers will help you.

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SIGHT FEED VALVES • FLOW INDICATORS

Circle **120** *on Time-Saver Card*

POST SCRIPTS OF INDUSTRY

Parker Seal distributors increase by 3

Three new distributors for Parker Seal products have been announced. These include Industrial Gasket and Packing Co., Inc., Tulsa, for synthetic o-rings, Great Lakes Rubber and Supply, Inc., Milwaukee, and Staver Hydraulics Co., Waverly, N. Y., for pipe flange connections and fasteners.

TOP DISTRIBUTOR of Republic valves in 1958 was Richard Hayman, at right, who received a Merit Award plaque from L. J. Henderson, v.p. of sales for Republic Mfg. Co., Cleveland, Ohio. Hayman heads the Haskel Engineering & Supply Co., Glendale, Calif. Awards were presented early in February at the Distributors Sales Conference.

Searle Leather expands

Searle Leather & Packing Co. of Los Angeles has enlarged its office and manufacturing facilities by more than 40 percent.

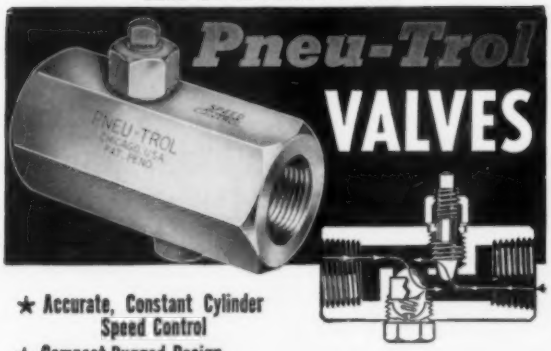
Howerton joins Cascade

Howerton

Raymond L. Howerton has been named sales manager for Cascade Mfg. Co., Portland, Ore. Howerton, who joined the company after many years experience in marketing material handling equipment, will be responsible for all company marketing activities.

Continued on page 179

Circle **15** on Time-Saver Card



★ Accurate, Constant Cylinder Speed Control
★ Compact Rugged Design
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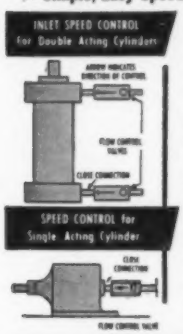

Pneu-Trol Speed Control Valves, are widely used in hundreds of control applications because they combine in a short, compact body, a tapered fine thread needle for extremely accurate air or oil flow control and a floating retro ball check, which permits full flow in the opposite direction. Retro ball floats in most sensitive position to its seat, requiring only a slight differential pressure to fully open or close it.

Needle design permits maximum flow capacity in the controlled direction. Metal to metal needle and ball seats insure long trouble-free service. Simple, practical "O" gland structure eliminates troublesome leaking. Valve bodies machined from hex brass or aluminum for 2000 psi working pressures; steel and stainless steel for 5000 psi. Made in 5 female pipe sizes—⅛" to ¾". ATTRACTIVE PRICES . . . IMMEDIATE DELIVERY.

Write for illustrated circular and prices.

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Circle **6** on Time-Saver Card

BREATHER-FILTER

protects housings, crankcases, storage tanks.

The Air-Maze breather-filter keeps dust out of engine and compressor crankcases, gearcases, hydraulic equipment, liquid storage tanks and machinery. Types and sizes available in both oil-wetted and oil bath models to protect every vented housing.

In the oil-wetted type, dust is impinged on a series of oil-wetted wire baffles. In the oil bath type, used where the dust concentration is unusually high, the filter media is enclosed in a bowl. Outside air must first pass through the oil, then the filter media, before entering crankcase or housing. Also functions as a backfire flame arrester.

Available in sizes from ⅛" to 3½". Permanent, all-metal, easily cleanable. Write for booklet BC-453. Made by AIR-MAZE CORPORATION, Cleveland 28, Ohio.

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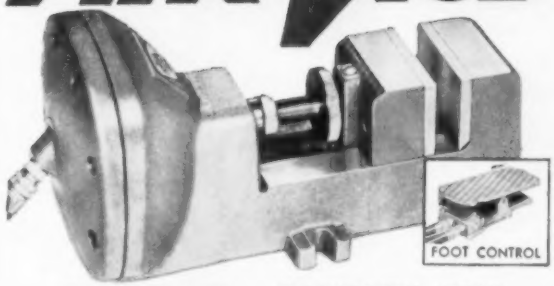

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POST SCRIPTS OF INDUSTRY

Almo appoints representative

Robert Cassell will represent Almo Manifold & Tool Co., Centerline, Mich., in Michigan and Ohio. Cassell, a registered professional engineer, has 11 years of experience in the field.

Cassell

Tannehill

Tannehill new sales v.p. at Tube Reducing

New v. pres. of sales for Tube Reducing Corp., Wallington, N. J., is Richard L. Tannehill. He will direct national marketing and sales activities for the company. Tannehill was previously New York district sales manager for the Roots-Connersville Blower Division of Dresser Industries, Inc.

Vickers' Chicago branch changes location

Location of the Chicago branch of Vickers Inc., Detroit, has been moved to 350 N. York Rd., Bensenville, Ill. The new building is west of the O'Hare Airport. As a result of the move, warehouse stocks and repair facilities have been increased.

Wilson is appointed Aeroquip manager

Wayne W. Wilson has been appointed factory manager of Aeroquip's Western Division in Burbank, Calif. Wilson has been in the production management field for 18 years and is a graduate of Stanford University and the California Institute of Technology.

New division created at Greer

A Products Division has been established by Greer Hydraulics, Inc., New York, and the new man-

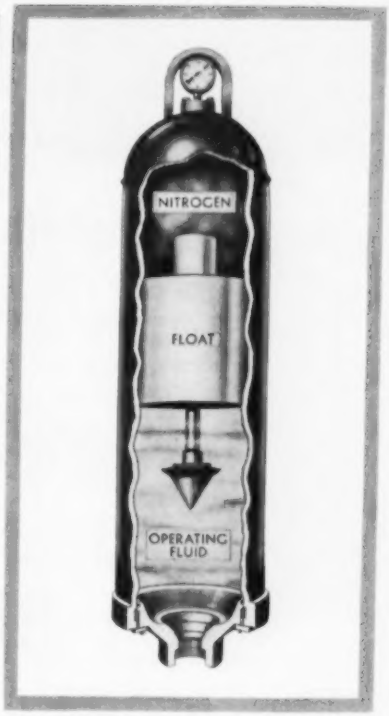
Continued on next page

15th National Conference on Industrial Hydraulics

- **WHEN**—October 22-23, 1959
- **WHERE**—Hotel Sherman, Chicago
- **SPONSORED BY**—Armour Research Foundation of Illinois Institute of Technology, and cooperating professional engineering societies.
- **PROGRAM**—Twenty technical papers will be given in sessions covering: space hydraulics, machine tools, pumps, pneumatics, forming machinery, mobile equipment, and servomechanisms.
- **ATTENDANCE**—Registration is open to all engineers in industry using fluid power.

FOR FULL DETAILS WRITE:

Raymond D. Meade, Conference Secretary
National Conference on Industrial Hydraulics
Technology Center
Chicago 16, Ill.



PAYNE NON-SEPARATOR TYPE ACCUMULATORS AND DESURGERS FOR WATER, OIL, AND DISTILLATES

This Payne accumulator is built especially for fluid storage and pump desurger applications. Construction is similar to other Payne non-separator type accumulators except for the shutoff valve, which is in two parts. An oversize packing element is attached to the float and seats on the lower element, which is set in the accumulator shell. The all metal float moves freely in the vertical accumulator and seats firmly when the fluid level reaches its low position. Nitrogen pre-charge is positively retained, and there is no vortex effect. The removable valve on the float seats first on the Hycar rubber element and then effects a metal to metal secondary seal. Repairs are safe, easy, and inexpensive. These accumulators are built in sizes from one to sixty gallons with maximum working pressure to 6,000 psi. Any volume is available with multiple units.

Payne

MANUFACTURING COMPANY INC.
P. O. Box 9364 Houston 11, Texas

Circle **129** *on Time-Saver Card*

POST SCRIPTS OF INDUSTRY

ager is Leonard H. Seeman. Alphonse Jacobellis was named assistant chief engineer of the new division's engineering activities. Seeman, who joined Greer in 1945, was promoted to his new post from manager of product sales. He will supervise engineering, manufacturing, sales, and planning for all hydro-pneumatic products.

Ostergren is district mgr. for Parker-Hannifin

J. F. Ostergren has been named district manager of distributor sales for a five-state area in the Southeast by Parker-Hannifin Corp., Cleveland, Ohio. Ostergren's district will be Florida, Georgia, Alabama, Mississippi, and the Memphis area of Tennessee. The new manager has been with William A. Dalee, Inc., Detroit, for ten years.

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OPW-Jordan appoints Ault district manager

Charles A. Ault, III, has been appointed Northwestern Area District Manager for OPW-Jordan, Cincinnati. Ault, with OPW since 1957, will make his headquarters in Seattle. He is a graduate of Miami University, Oxford, Ohio.

Sheffer names distributors for western areas

Three new western and far-western distributors for Sheffer Corp., Cincinnati, have been named. The Fornaciari Co., Los Angeles, will cover Southern California, Arizona, and Nevada. Covering the Washington and Oregon area will be Hydraulic and Air Equipment of Portland. Active Engineering Sales Co., Houston, will cover that area.

New distributor appointments

Pneu-Hydraulics, Cleveland, Ohio, is the distributor in that area for Westinghouse Air Brake Co., Wilmerding, Pa.

The Airoyal Co., Maplewood, N. J., will represent Almo Manifold & Tool Co., in northern New Jersey, metropolitan New York, and southern Connecticut.

Linear Seals, Inc., East Orange, N. J., is authorized agent for Linear, Inc., Philadelphia, in New York City, northern New Jersey, and New York State.

Kenett Corp., Brookline, Mass., is the New England representative for Valcor Engineering Corp., Kenilworth, N. J. Kenett will be responsible for military and commercial sales in the five-state area for Valcor's full line of solenoid valves.

Standard Supply Co., Minneapolis, will represent The Brunner Division of Dunham-Bush, Inc., of West Hartford, Conn., in four states. Standard will distribute industrial and automotive air compressors in Minnesota, North and South Dakota, and Northwestern Wisconsin.

Chicago-Wilcox Mfg. Co., Chicago, has been named as servicing distributor for U. S. Rubber packings. All packings in the U. S. Rubber line will be handled by Chicago-Wilcox.

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This axial-piston air motor can carry ½-ton overhung load

Stout spindle, tough bearings and rugged case give this air motor the ability to carry an overhung load as great as 1000 lb., with no external spindle support. Gardner-Denver axial-piston design packs 2.7 h.p. in 6 3/16" dia. x 13 3/4". Weighs 38 lb. Speeds to 2600 r.p.m. Starting torque to 82 ft.-lb. Variable speed. Reversible. Nonsparking. Works in heat, moisture or dust. Other sizes from 0.6 to 2.7 h.p.

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ACCO

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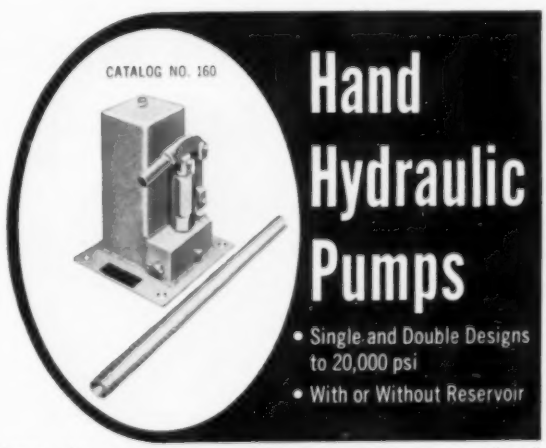

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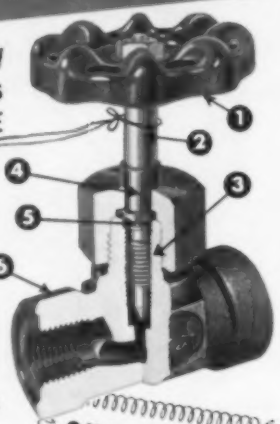
THE INSIDE STORY

ON THIS VERSATILE, NEW 100 SERIES GENERAL PURPOSE VALVE



1. Diecast Aluminum Handle
2. Centerless Ground Stem
3. Safe, Integral Bonnet
4. Exclusive Nylon Stem Wiper
5. GUARANTEED Leak-proof O-ring Seal
6. Rugged, Forged Carbon Steel Body in Globe or Angle Pattern

The new Series 100 line of full-flow, general purpose valves offers unusual features at a competitive price. Use for throttling, regulating, shut-off; over temperature range of —40 to 200°F. Male and female connections. Panel mounting, too.

Send for FREE SAMPLE VALVE on your company letterhead.

GUARANTEED against stem leakage From non-critical vacuum to 10,000 psi.

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HOKE INCORPORATED
Fluid Control Specialists
87 PIERMONT ROAD, CRESSKILL, N. J.

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M-1 ONLY $1.95

Sensational!

Industry's handiest new devices! They're made from polyether foam enclosed in anodized aluminum — they silence noises caused by exhausting air. Rust-proof; common solvents clean 'em! Use M-1 or 2 for 1/8" or 1/4" exhaust ports; M-3 for 3/8" port. Order your Mead Midget Mufflers direct or send for name of nearest Mead Distributor.

M-2 $1.95

M-3 $2.50

MEAD SPECIALTIES COMPANY

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20	40	60	80	100	120	140	160	180	200	220	240

NAME .....

COMPANY: .....

POSITION: .....

PRODUCT MFG.: .....

STREET .....

CITY ..... ZONE ..... STATE .....

Do not use after 8-15-59

NEW PRODUCTS

300	305	310	315	320	325	330	335
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1959 FLUID POWER PRIZE PAPER CONTEST

7TH ANNUAL COMPETITION

First Prize	$500
Second Prize	$300
Third Prize	$200
Fourth to Seventh Prizes, each	$ 100

To get your copy of the Contest Rules Booklet, Circle 240 on the Time Saver Card.

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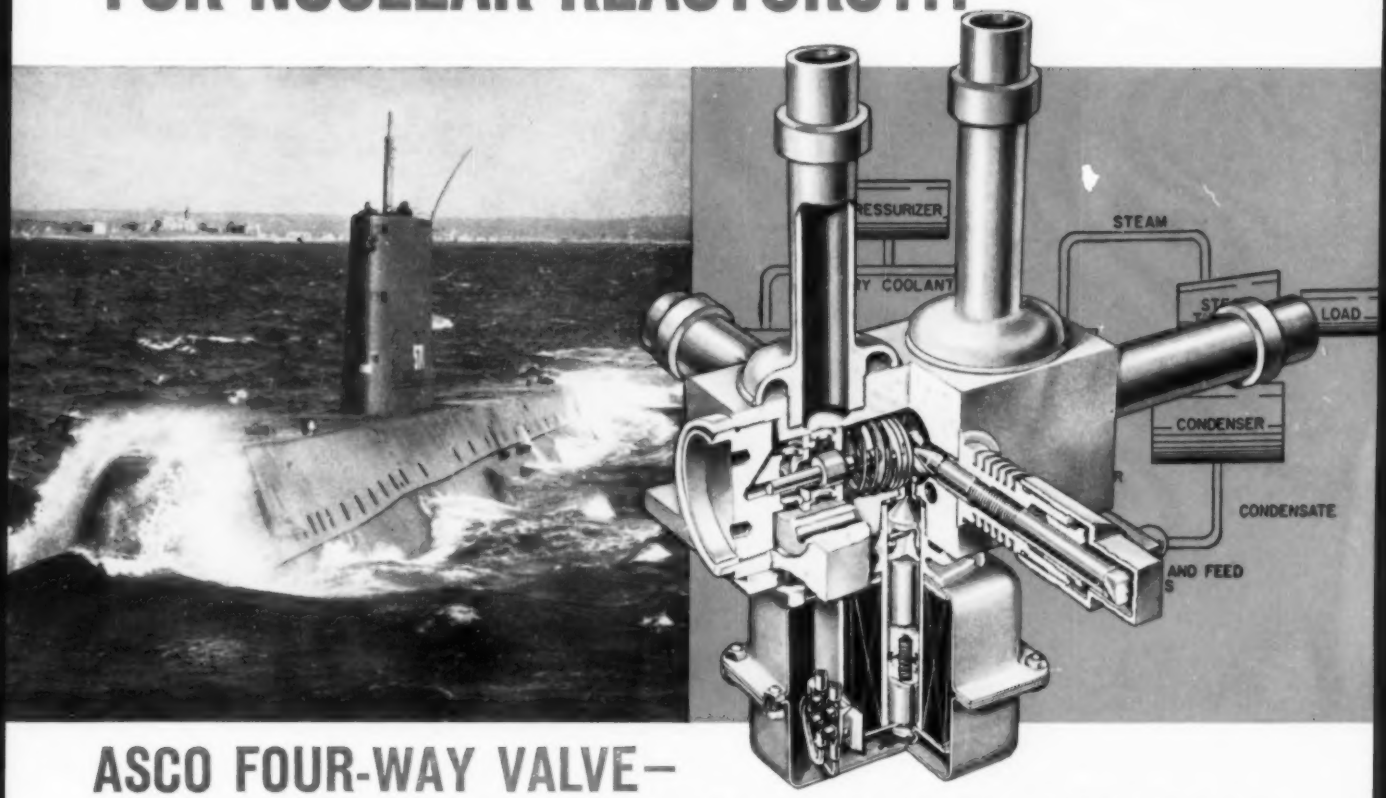
SOLENOID VALVES
FOR NUCLEAR REACTORS...



ASCO FOUR-WAY VALVE— CONTROLS ISOLATING VALVE IN CIRCULATING LOOP

From ASCO's nuclear energy facilities – the only ones in the Solenoid Valve industry to include a *hot test loop* – now comes a complete family of solenoid valves tailored to atomic energy requirements.

Typical is the 4-way valve illustrated above designed for the control of the main cylinder-operated isolating (stop) valve in the circulating loop. This stainless steel, packless type (hermetically sealed) valve features exceptionally tight seating—through beveled, poppet-type seats and discs. Solenoid pilot controlled and available with manual override, it is supplied in 1" size. This unit is suitable for 2500 P.S.I. differential pressure at 600°F.

Like all other ASCO Solenoid Valves designed for nuclear reactor systems, this valve has passed the most rigid tests under faithfully duplicated working conditions. ASCO 4-way Solenoid Valves are now in use on nuclear submarines powered with water-cooled reactors. Uniformly reliable and maintenance-free, ASCO 2, 3 and 4-way Valves are specified for primary and secondary systems of nuclear reactors, as well as for instrumentation control.

For further information, request "ASCO Valves for Nuclear Reactors" and Catalog No. 202.

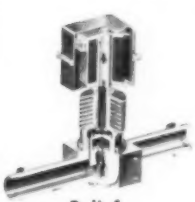
ASCO®

Automatic Switch Co.

50-B Hanover Road, Florham Park, New Jersey
FRontier 7-4600

Typical ASCO Solenoid Valves for submarines, military and commercial surface ships, and industrial power plants:

Primary System



Relief Valve

By-Pass Coolant Valve

Secondary System

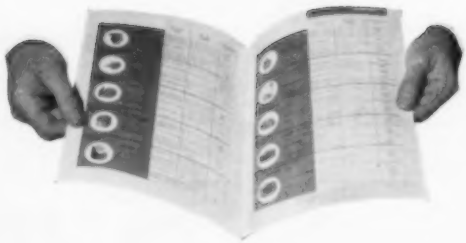
2-way Valves

3-way Valves

Instrumentation Control

2-way Valves

3-way Valves



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8 reasons why you should insert your advertising or condensed catalog in the 1960/61 FLUID POWER DIRECTORY

1. You are represented at design-development sessions when new products and services are discussed

2. You are assured that your story is accessible on weekends and after hours when planning sessions often take place

3. You protect yourself from any inadequacies of filing systems by putting your current story on file in THE FLUID POWER DIRECTORY where it can't be missed

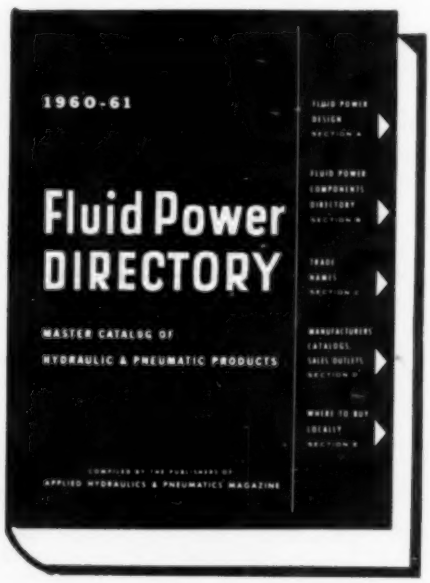
4. You're sure your story will come to the attention of new personnel whenever they come into your market, sometimes even before you have learned of these changes in companies of interest to you

5. You have an opportunity to win any new business coming into your field, when newcomers (unfamiliar with you or your competition) turn to THE FLUID POWER DIRECTORY for comparative information

6. You are certain of interest in your story at the time your message is seen . . . certain that the buyer is just as anxious to get information about your products as you are to have him get it

7. You are confident that your complete story is right there at the point of comparison to remind your prospects of the values they've read about in your advertising and sales promotion, and hear from your representatives

8. You are assured of representation at the point of sale when buyers are making their decisions and all other opportunities for telling your story are closed.



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